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# Interventions Used by Occupational Therapists and Allied Health Providers in Regards to Chronic Musculoskeletal Pain

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INTERVENTIONS USED BY OCCUPATIONAL THERAPISTS AND ALLIED  
HEALTH PROVIDERS IN REGARDS TO CHRONIC MUSCULOSKELETAL PAIN:  
A SYSTEMATIC REVIEW

by

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Advisor: Dr. Anne M. Haskins, PhD, OTR/L

An Independent Study

Submitted to the Occupational Therapy Department

of the

University of North Dakota

In partial fulfillment of the requirements

for the degree of

Master's of Occupational Therapy

Grand Forks, North Dakota

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This Independent Study Paper, submitted by Kara L. Maatz, MOTS and Jared Q. Zimmerman, MOTS in partial fulfillment of the requirement for the Degree of Master's of Occupational Therapy from the University of North Dakota, has been read by the Faculty Advisor under whom the work has been done and is hereby approved.

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Faculty Advisor

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Date

PERMISSION

Title            Interventions Used by Occupational Therapists and Allied Health  
                    Providers in Regards to Chronic Musculoskeletal Pain: A Systematic  
                    Review

Department    Occupational Therapy

Degree            Master's of Occupational Therapy

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## Abstract

**Problem:** Chronic musculoskeletal pain is the most widely known disability in the American health care system (National Institute of Health [NIH], 2010). Chronic pain affects how individuals are able to engage in meaningful activities of daily life. Unrelieved pain can potentially result in longer hospital visits, emotional distress, and increased re-admission rates to hospitals (The American Academy of Pain Medicine, 2012). A review of research in the American Occupational Therapy Association (AOTA) database revealed that few clinically useful references were available for practitioners regarding interventions used with chronic musculoskeletal pain (AOTA, 2014). As a result, it was determined that effective chronic pain management interventions should be further reviewed and analyzed through a systematic review.

**Purpose:** The purpose of this systematic review was to identify and investigate commonly used allied health interventions utilized with individuals who are experiencing chronic musculoskeletal pain and assess the utility of those interventions.

**Methods:** An extensive, systematic review of quantitative research was completed using PubMed because of its broad collection of health sciences literature. We selected particular inclusion and exclusion criteria aimed to identify high quality and rigorous evidence regarding preparatory, purposeful, and occupation-based interventions used in

occupational therapy and allied health professions in the treatment of individuals with chronic musculoskeletal pain. Specific research processes and analysis were used to develop an organizational framework of the treatment interventions in the reviewed literature regarding chronic musculoskeletal pain management.

**Results:** This systematic review yielded evidence that pointed to a diverse set of literature that varied in topic and rigor. While it does represent the “best” evidence available, the review showed a severe lack of high quality, replicated, and clinically useful occupation-based treatment interventions. Despite the absence of consistency in research topics, the review did reveal that programs that required a specified amount of time to be completed by subjects (and included an educational component regarding pain self-management) and consistent and frequent meetings with a designated health care professional provided better outcomes for clients with chronic musculoskeletal pain.

**Conclusion:** Despite the high numbers of individuals in the U.S. who experience chronic musculoskeletal pain, there is a dearth of research regarding clinically useful, occupation-based interventions for these individuals’ health care needs. There is a need for research focusing on the utilization of purposeful and occupation-based interventions addressing chronic musculoskeletal pain. The lack of research, highlighted in this systematic review, limits occupational therapy practitioners’ ability to prescribe effective, occupation, and evidence-based interventions for clients with chronic musculoskeletal pain in clinical practice.

## CHAPTER I

### INTRODUCTION

Chronic musculoskeletal pain is the most widely known disability in the American health care system (National Institute of Health [NIH], 2010). Pain symptoms have an effect on 100 million U.S. adults, which leads to increased rates of morbidity, mortality, and disability (Committee on Advancing Pain Research, Care, and Education & Institute of Medicine, 2011). Unrelieved pain can potentially result in longer hospital visits, emotional distress, increased readmission to hospitals, as well as a decreased ability to participate at optimal performance (The American Academy of Pain Medicine, 2012). Moreover, chronic musculoskeletal pain contributes to the nation's escalating health care costs – at least 635 billion dollars spent annually are a result of chronic pain conditions (Committee on Advancing Pain Research, Care, and Education & Institute of Medicine, 2011). As a result, it is imperative that health care professionals, such as occupational therapists, address this growing epidemic.

Review of research in the American Occupational Therapy Association (AOTA) database revealed that few clinically useful references were available for practitioners regarding interventions that could be used with clients with chronic musculoskeletal pain conditions (The American Occupational Therapy Association [AOTA], 2014). Due to the recent nature of health care promotion of shorter stays and fewer therapy sessions, it will be necessary for occupational therapists and allied health providers to have a

thorough understanding of evidence-based research interventions to utilize within daily practice. Consequently, effective pain management should be further analyzed and reviewed through performing a systematic review in order to analyze and explore the specific methods that may improve health outcomes.

We anticipated that there would be a dearth of research concerning effective chronic musculoskeletal pain management. Therefore, the purpose of this systematic review was to identify and investigate commonly used purposeful and occupation-based interventions utilized with individuals who experience chronic musculoskeletal pain and assess the utility of those interventions. We had confidence that this review would lead to an improved understanding of interventions that have the highest effectiveness when dealing with chronic musculoskeletal pain, as well as how this evidence may support the multidisciplinary team long-term. In order to accomplish this, specific methods needed to be considered.

Throughout this study, we utilized an atheoretical approach due to the broad nature of a systematic review. *The Occupational Therapy Practice Framework – Domain and Process -2<sup>nd</sup> Edition* (American Occupational Therapy Association [AOTA], 2008a) was applied to capture the area of occupation and methods that we wanted to analyze. Specifically, the area of “Health Management and Maintenance” was chosen, as self-management is included in this area (AOTA, 2008a, p. 631). Additionally, we sought to explore purposeful and occupational-based methods within published research to examine available evidence-based interventions. As a result, we incorporated evidence-based practice to obtain research that showed effective methods for our target population (Law & MacDermid, 2014). We hypothesized that there would be a lack of

information that delineated between interventions utilized in a home management program for those with chronic pain.

In order to obtain articles for our systematic review, PubMed was accessed through the Harley French Library of the University of North Dakota. PubMed was utilized because of its broad collection of biomedical and health sciences literature, accessible full text materials, as well as its variety of allied health professions included (Stein, Rice, & Cutler, 2013). Allied health provider articles were included with occupational therapy articles due to the hypothesized dearth of information. Furthermore, we did not use date ranges in publications due to the anticipation of limited available research.

As stated previously, there is a lack of research regarding the topic of chronic musculoskeletal pain. This absence of evidence-based interventions leads to further complications for health professionals developing home programs and is a limitation of this study. For this reason, our systematic review provides organizational framework of “best” research available to occupational therapists and other allied health providers for individuals experiencing chronic pain. An additional constraint was our lack of experience in completing systematic reviews, which may have impeded the research process. Conversely, measures such as review of existing systematic reviews, careful documentation of processes, and consultation with our advisor likely improved the quality of the systematic review.

## **Definitions**

Upon investigation of evidence-based literature, we found varying definitions of the term “chronic pain.” The following chart entitled *Chronic Pain Definitions as*

*Presented in the Literature* provides the reader the opportunity to examine the diverse operational definitions of chronic pain and other relevant definitions of our study.

*Chronic Pain Definitions as Presented in the Literature*

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Research Authors	Operational Definitions of Chronic Pain
Abbasi, Dehghani, Keefe, Jafari, Behtash, & Shams, 2012	Low back pain of greater than 6 months duration
Cassidy, Atherton, Robertson, Walsh, & Gillett, 2011	Back pain for at least 9 months
Castro, Daltro, Kraychete, & Lopes, 2012	Musculoskeletal pain diagnostic for at least 3 months
Coppack, Kristensen, & Karageorghis, 2012	Chronic back pain with mean duration of symptoms for 2.6 years
Da-Luz Junior, Costa, Fuhro, Manzoni, De-Oliveria, & Cabral, 2013	Chronic non-specific low-back pain with a duration of symptoms of at least 3 months
Garcia et al., 2013	Low back pain of at least 12 weeks duration and without a specific cause
Hofmann, Peters, Geidl, Hentschke, & Pfeifer, 2013	Chronic non-specific low-back pain is defined as pain persisting for at least 3 months, located below the costal margin and above the inferior gluteal folds, without referred leg pain and that is not caused by a known specific pathology
Jensen, Engel, & Schwartz, 2006	Chronic pain of at least a 3 month duration

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*Chronic Pain Definitions as Presented in the Literature*

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Research Authors	Operational Definitions of Chronic Pain
Kiyak, 2012	Low back pain is usually defined as pain, muscle tension, or stiffness located below the costal margin and above the inferior gluteal folds, with or without leg pain (sciatica). Non-specific low back pain is defined as symptoms without a clear specific cause that is low back pain of unknown origin
Mahalhaes et al., 2013	Non-specific chronic low back pain, which does not have a well-defined etiology, presents pain for at least 12 consecutive weeks
Roche-Lebourcher et al., 2011	Nonspecific chronic low back pain for at least 3 months
Sherman et al., 2011	Chronic back pain lasting more than 3 months and scoring more than 3 on a 11-point “bothersomeness” scale of 0 to 10
Tefner, Nemeth, Laslofi, Kis, Gyetvai, & Bender, 2012	Chronic low back pain persisting longer than 7-12 weeks
Vasseljen, Unsgaard-Tondel, Westad, & Mork, 2012	Chronic specific low back pain for 3 months or more, and pain score of 2 or more on a 0 to 10 Numeric Rating Scale (NRS)
Wong et al., 2011	Chronic pain persisting for at least 3 months at the moderate-to-severe level [i.e., at least 4 of 10 on an 11-point Numerical Rating Scale (NRS) pain score]

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Musculoskeletal system – refers to the bones of the skeleton, cartilages, ligaments, and muscles that work together to maintain posture and body position (Moncur, n.d.).

Preparatory methods – refer to “[m]ethods and techniques that prepare the client for occupational performance used in preparation for or concurrently with purposeful and occupation-based activities” (OTA, 2008a, p. 674).

Purposeful activity – refers to “[a] goal-directed behavior or activity within a therapeutically designed context that leads to an occupation or occupations. Specifically selected activities that allow the client to develop skills that enhance occupational engagement” (OTA, 2008a, p. 674).

Occupation-based interventions – refer to “[a] type of occupational therapy intervention – a client-centered intervention in which the occupational therapy practitioner and client collaboratively select and design activities that have specific relevance or meaning to the client and support that client’s interests, needs, health, and participation in daily life” (OTA, 2008a, p. 672).

Self-Management – refers to the capability of the client to work with all facets that a chronic illness involves, such as symptoms, interventions of treatment, physical and social consequences, and daily life changes (Coleman & Newton, 2005).

Chapter I reviewed the topic of chronic musculoskeletal pain and it provided a conceptualization of our research study. Chapter II provides an in-depth literature review we conducted in order to explore the research problem.

## CHAPTER II

### REVIEW OF STUDIES & LITERATURE

#### **Chronic pain**

Chronic pain is a growing problem in the United States. Rochman, Sheeman, and Kulich (2013) found that chronic pain has resulted in disabling effects for over 116 million individuals. Those individuals who experience chronic pain account for 12-16% of total emergency department visits, with approximately 7% requiring frequent hospital admissions (McLeod & Nelson, 2013). Chronic pain has been defined as any pain lasting for a period of 12 weeks, pain that persists for months, or pain that persists for a longer period of time than usually occurs for healing (Kedziera, 2001; McLeod & Nelson, 2013; National Institute of Health [NIH], 2011a). Both physical issues, such as fatigue or dysfunction of body, and psychological issues, such as depression, anxiety, or isolation, affect people experiencing chronic pain (American Occupational Therapy Association [AOTA], 2002; Kedziera, 2001).

Pain is a multifaceted experience for individuals throughout the world that can present in different ways, which may lead to further complications for those who experience it (International Association for the Study of Pain [IASP], 2013; McLeod & Nelson, 2013; Robinson, Kennedy, Harmon, 2011; Van Huet, Innes, & Stancliffe, 2013). Chronic pain can also cause a variety of impairments, affect relationships, and decrease individuals' strength, coordination, and independence. This can significantly

influence health-care interventions for individuals, depending on their personality, gender, and social support (AOTA, 2002; McLeod & Nelson, 2013; Van Huet et al., 2013). As a result, negative effects of chronic pain can persist across the lifespan, which may influence an individual's occupational performance in areas of self-care, employment, and community engagement (Rochman et al., 2013).

In the United States, chronic pain accounts for the primary reason that individuals seek medical care (Rochman et al., 2013). It has also been found that chronic pain may increase the occurrence of chronic health problems including arthritis, degenerative joint disease, vascular disease, and osteoporosis (Kedziera, 2001). However, Robinson et al (2011) found that it is common for services to be limited and waiting periods for treatment to be lengthy for individuals experiencing chronic pain. Despite the prevalence of chronic pain and its association with other disease processes, there is dearth research explaining how individuals manage their pain long-term (Van Huet et al., 2013). Management of chronic, long-term pain becomes a way of life for individuals who are afflicted with this condition on a daily basis.

Chronic pain may reduce a person's ability to manage a productive lifestyle (Harris, Morley, & Barton, 2003), which can cause imbalances between self-care, employment, leisure, and restful sleep (Van Huet et al., 2013). Ultimately, individuals experiencing chronic pain may not take part in occupations that can increase health and well-being through active engagement in meaningful activities (Robinson et al., 2011). Occupational therapists understand the importance of maintaining a productive lifestyle geared toward optimal health and well-being. However, approximately 30% of people who seek medical care report pain symptoms (Hasselstrom, Liu-Palmgren, & Rasjo-

Wraak, 2002). Furthermore, 26% of subjects with chronic pain in a Swedish survey reported significant limitations with everyday activity (Skjutar, Schult, Christensson, & Müllersdorf, 2010). Therefore, skilled occupational therapy services can be useful for individuals who are experiencing chronic pain problems (Skjutar et al., 2010).

### **Occupational therapy role**

Occupational therapy focuses on the client and is concerned with promoting health and well-being through everyday activities, or occupations, that individuals carry out in solitary contexts, in families, or with groups to occupy time and bring meaning and purpose to life (World Federation of Occupational Therapists [WFOT], 2012). The overarching goal of the profession of occupational therapy is to enable people to participate in their occupations (WFOT, 2012). Occupational therapists achieve this goal by collaborating with individuals and groups of people to increase their ability to participate in the occupations they want to, need to, or are expected to, or by adapting the occupation or the environment to better support individuals' occupational engagement (WFOT, 2012). Occupational therapists can also schedule a home visit to review the individual's home environment and make recommendations based on the ability to move items in the home setting. This will allow the self-management program to be more personalized to the individual experiencing chronic pain. Because of the holistic approach of occupational therapy, therapists are able to practice in a variety of settings.

The focus of the intervention an occupational therapist provides can change depending on the type of program or setting, whether it is inpatient, outpatient, hospital, or community. Reimbursement capabilities of clients, such as their use of private or public pay, also are a factor in treatment focus and intervention. Regardless of

influencing variables, the primary aim of occupational therapy should be emphasis on enabling the individual who is receiving care to increase his or her ability to carry out occupations of choice (Van Huet et al., 2013). However, it has been found that not all professions find chronic pain management strategies effective (McLeod & Nelson, 2013). It is appropriate to develop protocols so that all health care settings provide a consistently supportive, cohesive, and integrated approach to managing symptoms experienced by patients with chronic pain syndromes (McLeod & Nelson, 2013). In order to achieve universal consideration for chronic pain management strategies, direct attention about this topic is needed by the profession of occupational therapy, its practitioners, and students.

Rochman et al. (2013) described how occupational therapy students, new graduates, and current practicing therapists have regularly presented with little knowledge and misinformed attitudes of chronic pain management. Realistically, occupational therapists can assist individuals with specific techniques to enable them to participate fully in their everyday occupations. Since occupational therapists frequently serve patients who experience chronic pain (Rochman et al., 2013), a higher level of instruction in education courses on the assessments, interventions, and therapy processes used with individuals experiencing chronic pain is needed. Consequently, health care employees with high knowledge of the symptoms and presentation of chronic pain are more likely to utilize effective pain management techniques (Rochman et al., 2013). The profession of occupational therapy is in a unique position to assist in managing and reducing disabling levels of chronic pain for persons in any setting. Occupational

therapists have a vast knowledge-base regarding techniques that can be utilized to improve optimal performance of daily occupations.

Education regarding the management of chronic pain will serve well to enhance the client-centered treatment plan. Ideally, educational courses for occupational therapy students and practitioners would highlight varying best practice approaches and interventions that can be used during therapy to increase the client's ability to manage his or her chronic pain. Currently, occupational therapy interventions are assigned to one of three categories: preparatory, purposeful, and occupation-based. Preparatory methods are defined as “[m]ethods and techniques that prepare the client for occupational performance used in preparation for or concurrently with purposeful and occupation-based activities” (American Occupational Therapy Association [AOTA], 2008a, p. 674). Such interventions may include the use of weights, theraband, stretching, manual therapy, and physical agent modalities (PAMs). PAMs are interventions periodically utilized when there are underlying musculoskeletal, integumentary, and neurological disorders that decrease the individual's ability to perform his or her enjoyed occupations (AOTA, 2008b). These interventions include the use of energy to modify scar tissue, edema, and inflammation in order to heal injury and increase performance (AOTA, 2008b).

Purposeful activity is defined as “[a] goal-directed behavior or activity within a therapeutically designed context that leads to an occupation or occupations. Specifically selected activities that allow the client to develop skills that enhance occupational engagement” (AOTA, 2008a, p. 674). Purposeful activities can include practicing casting with a fishing pole, making a small meal to regain endurance for a complex meal

for a family, or training in the use of adaptive equipment in order to increase independence in occupation-based tasks. Finally, occupation-based interventions are known to be “[a] type of occupational therapy intervention – a client-centered intervention in which the occupational therapy practitioner and client collaboratively select and design activities that have specific relevance or meaning to the client and support that client’s interests, needs, health, and participation in daily life” (AOTA, 2008a, p. 672). Occupation-based interventions include hobbies or tasks that an individual carries out in his or her daily life, such as laundry, putting dishes away, knitting, typing, and any other task found in his or her daily routines. These categories help the occupational therapist determine the course of therapeutic intervention for a client experiencing chronic pain.

Occupational therapy interventions address chronic pain by exploring the influence of pain on occupational performance, reducing disability, and changing home and work environments (Skjutar et al., 2010). The first step to effective pain management is gathering data through a comprehensive initial assessment, which includes trying to identify the cause of pain and the barriers it presents. Kedziera (2001) reported that the individual’s subjective opinion is the most important part of the assessment process, including both physical and psychosocial components. Along with this, it is essential that occupational therapists recognize self-report measures as one of the best tools for gauging an individual’s pain (IASP, 2013). These measures may include the client’s perception of his or her pain intensity, the location of the pain, and the type of pain he or she is feeling (such as tingling, numbness, sharp or dull). Other factors that may affect the client’s pain level is the time of year, how the pain started or has

changed, as well as what has been used to relieve the pain or what causes further aggravation (IASP, 2013). A thorough assessment is the cornerstone to developing an individualized treatment plan, which can provide information that can assist clients in developing and sustaining identifiable life routines through recovery. Not only are habits and routines an important part of pain management, it is essential to consider that varying degrees of chronic pain may be experienced differently across the lifespan.

### **Chronic pain limitations**

Chronic physical pain is widespread among all populations and age groups. Kedziera (2001) discovered that 25-50% of community-dwelling elders reported impairments related to chronic pain. In addition, 45-80% of residents living in long-term care facilities experienced chronic pain that often went untreated (Kedziera, 2011). Interestingly, populations of older adults have typically reported less pain as they aged (Kedziera, 2011). Specifically, it has been found that adults who are older often do not discuss their pain with their health care providers, as clients who are elderly have been documented to be fearful of additional tests and losing their independence (Kedziera, 2011). However, it is likely that poor pain management in the older population stems from a lack of knowledge and inappropriate attitudes, such as “pain comes with age” (Kedziera, 2001, p. 5).

Additionally, the lack of pain-related knowledge in the general population could be attributed to the shortage of information about pain management approaches utilized by health care providers and students (Rochman et al., 2013). The previously mentioned, misinformed attitudes of chronic pain management may also contribute to this lack of knowledge. As a result, this demonstrates the significance of occupational therapists’

learning and knowing effective pain management techniques in order to help assist others (Rochman et al., 2013). Furthermore, it is vital to understand how self-management techniques can improve quality of life for individuals experiencing chronic pain.

### **Self-management**

Coleman and Newton (2005) defined self-management as the capability of the client to work with all facets that a chronic illness involves, such as symptoms, interventions of treatment, physical and social consequences, and daily life changes. With a self-management approach, clients are able to monitor their chronic illness or pain and make modifications to cognitive, behavioral, and emotional factors to improve their quality of life (Coleman & Newton, 2005).

Recognizing that chronic pain can have debilitating effects upon an individual's life, it is important to understand that effective pain management can create a successful return to routine activities of daily living. Therefore, it is important to help individuals learn alternative strategies to manage symptoms of chronic pain to improve long-term outcomes. Carroll, Rothe, and Ozegovic (2013) discussed coping and use of self-directed techniques as an important step to managing chronic musculoskeletal pain. Through use of a qualitative research design, a leading theme surfaced and indicated that pain is a life-defining attitude in which coping is necessary to manage and help eliminate symptoms of chronic physical pain (Carroll et al., 2013). By allowing individuals with chronic pain to evaluate their own functional outcomes and limitations, occupational therapists can utilize this information to help develop the individualized plan of therapeutic intervention to improve clients' satisfaction and increase their quality of life.

Boyers et al. (2013) found evidence that techniques provided by occupational therapists for individuals to use at home for self-management are effective approaches among older adults experiencing chronic pain. Boyers et al. (2013) also found that for older adults experiencing chronic pain, a self-management strategy of exercise-based interventions was an effective method of reducing health care costs. Self-management programs may have a higher impact on cost reduction when compared to more intensive control treatments or usual care. Consequently, individuals can improve their health status and decrease utilization of services and health care costs (Boyers et al., 2013; World Health Organization [WHO], 2003). For example, an individual who maintains a regular exercise program is at a lower risk of having to see a general practitioner, which saves money in system-wide health care costs as well as for the individual (Boyers et al., 2013). This reduction in individual health care costs is directly related to compliance in an individual's self-management treatment plan (Boyers et al., 2013).

O'Toole, Connolly, and Smith (2013) examined the impact of a six-week long, one time per week, self-management program on individuals with chronic diseases. The sessions included instruction from an occupational therapist on topics including health, fatigue management, physical activity, mental health, and medication management. A booklet was provided for each of the 16 subjects to track progress and achieved goals. Subjects were assessed before the program, directly after the program was completed, and at an eight-week follow-up. Subjects were shown to be compliant resulting in an increase in self-efficacy, an increase in positive mood, and an increase in satisfaction of their performance in occupations (O'Toole et al., 2013).

Successful self-management programs rely on dedicated individual compliance (WHO, 2003). Alexandre, Nordin, Hiebert, and Campello (2002) defined compliance as an active process where the client tries to work towards being healthy and maintain that level while collaborating with his or her health care provider. Compliance has been identified as the most unpredictable and least manageable variable in an intervention process (Kirwan, Tooth, & Harkin, 2002). According to Kirwan et al. (2002), there are more than 200 characteristics pertaining to compliance. These characteristics relate to the client, the treatment schedule, factors of the disease, therapeutic relationship, and the clinical ambiance (Kirwan et al., 2002).

It has been found that as many as 40% of clients fail to comply with self-management programs depending on the difficulty of the program and conditions of the client (Martin, Williams, Haskard, & DiMatteo, 2005). Martin et al. (2005) also found that noncompliance rose to a level of 70% when self-management programs were high in complexity and demanded change of existing habits and lifestyle. Hence, occupational therapists should investigate strategies further to reduce the level of complexity, therefore making it easier for individuals to incorporate these programs into their daily routines.

Self-management programs require significant discipline by the client in order to be successful. Detriments of compliance to self-management programs have been categorized depending on the individual. Mayoux-Benhamou et al. (2005) studied predictors of compliance to attempt to increase compliance by subjects. Mayoux-Benhamou et al. (2005) found that 61% of their 135 subjects stated that motivation was a factor with compliance, which was defined as completing 50% of assigned exercises. Secondly, subjects identified time as a key factor when applied to work

demands, time spent in school, and performing their exercises along with other homework given at different therapies (Kirwan et al., 2002). The more time spent fulfilling these other obligations, the lower subjects' compliance with the self-management program (Kirwan et al., 2002). Self-motivation serves as the framework to achieve a positive therapeutic outcome for a self-management program.

Moreover, 4% of subjects in the Mayoux-Benhamou et al. (2005) study stated that pain was also a factor in their noncompliance to self-management programs. Some individuals believed that pain had an organic source and the exercises or interventions that they were prescribed to do at home would not have an influence on the level of pain experienced (Kirwan et al., 2002). Family interference was also found as a factor that impeded compliance. Alexandre et al. (2002) found that dependence on parents, as well as having the responsibility of taking care of children, lowered compliance rates. Furthermore, financial problems were a factor. Individuals who had no insurance or little income had lowered levels of compliance (Jin, Sklar, Oh, & Li, 2008). It is a priority for occupational therapists to discuss the aforementioned factors with the individual to increase compliance and strengthen the overall client-therapist relationship.

### **Therapist and client interaction**

Multiple studies revealed certain factors that lead occupational therapists to develop positive relationships with clients to increase compliance. Kirwan et al. (2002) found that compliance was increased if therapists kept clients on the therapists' schedule for the length of therapy, as well as scheduling the client at his or her convenience and for the appropriate length of time. In addition, being on time for each appointment, keeping the environment clean with as minimal distractions, and using approaches to gain clients'

trust and respect were necessary for increased participation and compliance (Kirwan et al., 2002). Occupational therapists are well versed in establishing a positive therapeutic rapport where a mutual understanding of the goal for the treatment plan exists.

Understanding the nature of the therapeutic relationship is essential as an occupational therapist. Taylor (2008) identified that negative client-therapist relationships can have detrimental effects. If this occurs, clients may resist advice or suggestions throughout therapy while at the same time he or she may not be able to provide feedback or alternative suggestions to reach the therapeutic plan of care successfully (Taylor, 2008). Strategies that may help alleviate some of the negative behaviors include giving constructive feedback, incorporating different therapeutic modes, and watching nonverbal cues (Taylor, 2008). By integrating these strategies, occupational therapists may be able to facilitate effective teamwork and create professional relationships between themselves and their clients.

Using a variety of therapeutic modes is important to consider when working with clients with chronic pain who experience difficulties in daily life. In addition, giving constructive feedback will give clients helpful information to improve reciprocal communication to increase positive outcomes (Taylor, 2008). Taylor (2008) identified the importance of using all six therapeutic modes, including *advocating*, *collaborating*, *empathizing*, *encouraging*, *instructing*, and *problem solving*. Taylor (2008) described that therapists use the *advocating* mode when there are physical, social, and occupational barriers that impede gains within the therapeutic process. The *collaborating* mode involves making all decisions in therapy together with the client and encouraging client participation and independence through the course of therapy (Taylor, 2008). In the

*encouraging* mode, the therapist instills courage and determines the motivating factors that facilitate a successful performance (Taylor, 2008). Therapists use the *empathizing* mode to summarize what the client has said to obtain a greater understanding of the clients' emotional experience (Taylor, 2008). The *instructing* mode is used to highlight education for clients in therapy with therapists providing clear descriptions that match clients' preferred learning style (Taylor, 2008). Finally, Taylor (2008) proposed that therapists use the *problem-solving* mode to solve interpersonal difficulties using a logical approach. Using all of the interpersonal modes allows occupational therapists to ensure a more focused therapeutic relationship, which may enhance compliance.

The WHO (2003) found that clients had a more negative approach to therapy and lower compliance rates if they are not given the power to make decisions in the therapy process. Occupational therapists should invite and allow clients to describe what activities were part of their life pre-injury or illness. Notably, individuals found to be physically active prior to injury have higher compliance than those who were not physically active (Chan & Can, 2010). Problematically, physical exercise can also be a detriment to client recovery. Mayoux-Benhamou et al. (2005) found that 18.5% of the 135 subjects were noncompliant because of substitution of exercises done prior to injury. Along with determining activity level prior to injury, occupational therapists also need to explain the reasoning behind assigned exercises (Chan & Can, 2010). Clients were found to be less compliant if they did not understand how the exercises were benefitting their recovery (Kirwan et al., 2002). Repeated evaluations of objective information showing progress and incentives were found to increase compliance in

clients (Mayoux-Benhamou et al., 2005). Additionally, clients may realize increased quality of life through the amount of exercises completed successfully.

Henry, Rosemond, and Eckert (1999) found that fewer exercises increased compliance with subjects. Henry et al. (1999) gave exercise programs of two, five, and eight exercises to identify which program had the highest compliance. Two exercises were found to have the highest compliance level of all programs (Henry et al., 1999). Along with fewer exercises, revising exercises for a more individualized self-management program was shown to increase compliance by showing continuation of therapy (Chan & Can, 2010). Occupational therapists work in partnership with individuals to create the personalized therapeutic plan of care, which assists in helping each individual experiencing chronic pain achieve steady progression through recovery.

O'Hagan, Coutu and Baril (2013) explored how individuals perceived the change of their injuries throughout the course of rehabilitation. Sixteen subjects experiencing chronic pain and significant impairments from work-related injuries were included in this study. A course of three semi-structured interviews was conducted over a period of 12 weeks. The results indicated that clients preferred a clinical discussion with the therapist to develop a greater level of understanding in the most effective treatment of their persistent pain and injury (O'Hagan et al., 2013). Therefore, it is essential for occupational therapists to assess clients' self-reports in finding solutions to rectify their chronic pain. Occupational therapists will need to embrace a holistic approach and work collaboratively with individuals in order to improve the therapeutic relationship, and ultimately enhance the clients' occupational performance in routine activities of daily life.

Collaboration in the client-therapist relationship is an essential tool that needs to be utilized when therapists choose assessments and interventions in the therapy process (IASP, 2013). The occupational therapist needs to use the information gained from talking with the client to analyze activities to predict the effects of pain on the individual's performance in the task, as well as the effects to his or her daily life (IASP, 2013). Activity analysis is a clinical practice tool that is taught during occupational therapy students' education to meet and fulfill the performance needs of clients in their occupations at any point in the lifespan (Perlman, Weston, & Gisel, 2005). The process of activity analysis involves changing the occupation in order for the client to complete the chosen task successfully. Selecting the right intervention is a vital task during the therapeutic process. If the task is too difficult, the clients may become discouraged in themselves for not being able to finish the task and then be reluctant to continue therapy. If the task is too simple, the clients may not achieve the full benefit of the therapeutic plan of care. Ultimately, appropriate balance between individual skill and desire to complete the task is necessary.

### **Therapeutic process**

When both the challenge of the activity and the skills of the individual are high, he or she is enjoying the activity and expanding his or her abilities with the hopeful outcome of learning new skills and increasing self-esteem and personal capabilities (Csikszentmihalyi & LeFevre, 1989). The focused attention experienced during those challenging activities can alter pain symptoms and have the potential to modulate pain (Villemure & Bushnell, 2002; Wiech & Tracey, 2009). Robinson, Kennedy, and Harmon (2012) asked 30 subjects to complete a questionnaire pertaining to daily activities at

seven different time periods during the day. They found that the subjects' concentration, self-esteem, and motivation were higher while engaging in activities that they thoroughly enjoyed. In comparison, the subjects' boredom and anxiety statuses were lowest during these activities as well (Robinson et al., 2012). The findings of Robinson et al. (2012) support the notion that occupational therapists should provide the most appropriate intervention for each client to participate fully in his or her therapeutic plan of care.

Therapists can assist a client in implementing strategies that will prevent pain or fatigue in a specific task or throughout the entire day. This can be achieved by planning and adapting activities so that the client's energy level is maintained while the pain is minimized (IASP, 2013). Intervention strategies may include changing how the individual's home is set up such as moving items to an easier level to reach, the removal of obstacles within the environment, and learning organizational practices for dressing and grooming (British Society for Rheumatology and IASP Musculoskeletal Taskforce, 2008). In addition, instruction regarding energy conservation techniques, such as gathering all clothes the night before, may be beneficial. These strategies may change the individual's routines, such as adding time to finish a task or learning how to use new adaptive equipment. It is critical for individuals to understand that learning new techniques may need to be practiced to ensure optimal levels of occupational performance.

Developing a daily routine with the individual to support the clients' adjustment to new habits and processes is warranted. Ensuring the individual is able to carry out required and discretionary tasks plays a significant role in the distinctive collaborative approach between the client and therapist (IASP, 2013). Evaluating the use of new

habits, adaptive equipment, and assessing the success of the interventions that were utilized ensures client satisfaction in the therapy process (British Society for Rheumatology and IASP Musculoskeletal Taskforce, 2008). Moreover, clients who are able to continue to engage in leisure activities are more satisfied throughout their recovery than those who are not able to take part in such activities. Therefore, encouraging active participation in a variety of activities and involving family members are also critical factors to consider when developing the therapeutic plan of care with the interdisciplinary team (IASP, 2013).

The most detailed treatment plans are created when the occupational therapist initially focuses on the individual experiencing chronic pain as an integral part of therapy. Involving other members of the interdisciplinary team is also a crucial component in maximizing client success (NIH, 2011). Since chronic pain does not have a definite cure, the health care team can set a goal to work towards the reduction of pain to improve the individual's quality of life and ability to function (NIH, 2011). When chronic pain is initially diagnosed, a physician, psychiatrist, and pain specialist are often the first members of this individual's health care team (Pergolizzi et al., 2013). However, as the chronic pain persists and affects other factors of the individual's daily life, a more complex team should be formed (Pergolizzi et al., 2013). Pergolizzi et al. (2013) wrote that this team may consist of medical and non-medical team members including pharmacists, dieticians, educational therapists, occupational therapists, and social workers in order to provide clients support that is needed to manage their chronic pain. Specifically, clients who have difficulty with work-related activities, difficulty performing activities of daily living, and those with hand and upper-extremity functional

difficulties should be referred for skilled occupational therapy services in a multidisciplinary setting (British Society for Rheumatology and IASP Musculoskeletal Taskforce, 2008). A multidisciplinary approach is warranted to reduce chronic pain successfully.

### **Multidisciplinary approach**

Fedoroff, Blackwell, and Speed (2013) found that a multidisciplinary focus including physiotherapy, relaxation training, and psychoeducation sessions had a lasting effect of positive coping with chronic pain for individuals who participated in group sessions. Relaxation techniques that were prescribed for clients included mindfulness, meditation, and body scan focus (Fedoroff et al., 2013). In this study, the psychoeducation groups focused on goal setting, management of chronic pain, being assertive while communicating, managing emotions, and pacing or energy conservation techniques (Fedoroff et al., 2013). Fedoroff et al. (2013) found that depression, disability, severity of pain, and interference in daily lives decreased allowing the individuals to experience positive outcomes from the group sessions. These effects were noted at the 3 month follow-up as well (Fedoroff et al., 2013). Therefore, a client-centered, multidisciplinary approach of chronic pain management may lead to improved health outcomes long-term. Although in order to accomplish this, it will be necessary to understand what factors may impact a successful return to occupational engagement.

### **Therapist and client perceptions of chronic pain**

Skjutar et al. (2010) explored health perceptions of practicing occupational therapists who delivered interventions to individuals experiencing chronic pain. Five sub-themes were identified including “pain behavior prevented engagement in

activities”, “lack of knowledge about pain mechanisms and strategies to deal with pain”, “occupational imbalance in work, leisure and home”, “emotional stress and depression due to pain”, and “physical or environmental strain resulting in limitations in occupational performance” (Skjutar et al., 2010, pp. 97-99). These 5 sub-themes contain 13 categories that were specific indicators of the need for occupational therapy and included body language signaling pain, disproportionate activity pattern, lack of coping strategies, and lack of enjoyable activities (Skjutar et al., 2010). Understanding the specific behaviors exhibited from experiencing chronic pain may facilitate additional occupational therapy referrals from other health care professionals. The multidisciplinary team must be aware of the challenges individuals experience due to intermittent exacerbations of chronic pain.

Aegler and Satink (2009) studied the experience of individuals with chronic pain. The subjects stated that pain was felt every day with fluctuating intensity at unpredictable times. Aegler and Satink (2009) found that the existence of pain created a challenge to stay active in occupations that they enjoyed. However, the subjects stated that they were able to change the arrangement of their daily routine in order to engage in and/or adapt to their meaningful occupations (Aegler & Satink, 2009). Within these occupations, the subjects scheduled breaks in order to preserve energy and regain motivation to return to the task at a later time (Aegler & Satink, 2009). Due to the distraction of activities, subjects engaged in occupations were less aware of the pain they were experiencing (Aegler & Satink, 2009).

Persson, Andersson, and Eklund (2011) also studied the effects of chronic pain on individuals. Results indicated that individuals were able to make frequent changes to

their schedule depending on the intensity and duration of their pain (Persson et al., 2011). Some of the tactics subjects utilized were daydreaming, choosing particularly important occupations to maintain in their schedules, adopting new values, and changing their focus from material items to non-material items (Persson et al., 2011). These strategies were successful in aiding individuals to maintain their roles and perform occupations that were meaningful prior to the onset of chronic pain.

Using a qualitative research design, Van Huet et al. (2013) explored factors that contributed to individuals' chronic pain management from an occupational therapy perspective. Researchers interviewed practicing occupational therapists to determine how they provided interventions for individuals experiencing chronic pain (Van Huet et al., 2013). Negative themes emerged in this study. These themes included: "losing valued roles", "having depression and receiving compensation", "being fearful by looking for a cure or not knowing what to expect", and "being unable to set goals or being unable to use strategies" (Van Huet et al., 2013, pp. 59-60). On the contrary, many positive themes also emerged including: "the importance of maintaining valued roles and having good social support" and "accepting the long-term nature of pain and being ready to change thinking about pain, such as setting realistic goals, pacing activity and using relaxation" (Van Huet et al., 2013, pp. 60-61). Consequently, understanding these perceptions could greatly influence the positive treatment outcomes that the profession of occupational therapy supports.

## **Summary**

Notably, and as supported by evidence, Chapter II provided descriptions about how chronic physical pain is a growing problem in the United States and worldwide. While a

growing body of evidence supports numerous preparatory interventions for clients with chronic pain, only a fraction of published literature has provided support for purposeful and occupation-based interventions. There is dearth-summarized information pertaining to specific occupation-based interventions that can be carried out by individuals experiencing chronic pain. Specifically, while there is evidence that suggests that certain interventions are beneficial for clients experiencing chronic pain, no published systematic reviews or metaanalyses were found that distinctly identify best practice purposeful or occupation-based interventions for occupational therapy. Therapeutic intervention by an occupational therapist can provide instruction in alternative approaches for executing tasks independently at home, work or a health care setting that may prevent further debilitating pain. The skills of an occupational therapist provide a valuable service for individuals experiencing chronic pain. These tools and techniques enhance the ability to perform required or desired meaningful occupations, but further examination of moderate to high-level research is needed to identify best practice.

The purpose of this systematic review was to investigate literature regarding interventions utilized with individuals experiencing chronic pain and its influence on occupational therapy practice. The profession of occupational therapy is unique in its ability to synthesize individuals' valued roles, their environment, their engagement in daily occupations, and any facilitators or barriers toward optimal occupational performance and well-being. In Chapter III, Methodology, we have described the methods utilized to complete the systematic review regarding occupation-based interventions for individuals experiencing chronic pain.

## CHAPTER III

### RESEARCH METHODOLOGY

Chapter III consists of a description of the methods implemented in order to complete this systematic review. We completed an extensive electronic systematic review of literature. PubMed was accessed through the Harley French Library of the University of North Dakota. PubMed was utilized because of its broad collection of biomedical and health sciences literature, accessible full text materials, as well as its variety of allied health providers included (Stein, Rice, & Cutler, 2013). Due to the necessity of narrowing our research parameters to incorporate the major focus of our study, we selected the following MeSH terms: *chronic pain, rehabilitation, musculoskeletal pain, allied health occupations, upper extremity, low back pain, and intractable pain*. Additionally, we selected specific inclusion and exclusion criteria prior to identifying research in order to critically appraise its applicability to our study. In specific, we chose quantitative rather than qualitative research because of its ability to differentiate between dependent and independent variables (Stein et al., 2013) and recognized high level of rigor. Inclusion criteria consisted of: quantitative research, self-management interventions, occupational therapy and allied health providers, a sample size of 10 subjects or greater, inclusion of chronic pain, and articles published in English. Exclusion criteria consisted of: medication used as an intervention, electric modalities as interventions, qualitative research, systematic reviews, meta-analysis,

methodological studies, and articles regarding the topic of neck or cervical pain. We did not use date ranges in publications due to the anticipation of limited available research.

We independently reviewed all titles and abstracts identified by the search to determine if the full text would fit the inclusion and exclusion criteria. After this evaluation, articles that unquestionably did not meet the criteria were excluded. If the article did not meet the previously determined criteria, a rationale for its exclusion was also written. The research team, consisting of ourselves and our advisor, then reviewed the remaining articles. The full texts of all the studies selected by at least one of us were then evaluated independently and discussed. Discrepancies were deliberated and resolved by consensus, or were brought to our advisor to reach a final decision. After each article was approved for use in the study by our team, we independently read and selected information from the article and placed it in a previously constructed organizational framework. The following content is an expanded narrative of the process used throughout the systematic review process.

The first search was carried out using the terms “chronic pain and rehabilitation.” A total of 198 articles were retrieved. From these article titles and abstracts, 174 were excluded as they did not meet the inclusion criteria. Eighty-nine articles were excluded due to being out of the scope of this study, 28 for not utilizing an intervention, 13 for their qualitative design, 11 for their focus on mental health, 8 for the use of medications as an intervention, 8 for their focus on assessment rather than intervention, 6 due to their systematic review design, 4 for not being published in English, 4 for using physical agent modalities as interventions, 2 for using a Rasch Analysis research design, and 1 for not having a large enough subject population. After review by our research team, 4 more

articles were excluded. These 4 articles were excluded due to being out of the scope of this study. Twenty articles met the criteria to have their full text reviewed and evaluated for inclusion in the organizational framework.

The second search was carried out using the terms “chronic pain and musculoskeletal pain”. A total of 99 articles were retrieved. From these article titles and abstracts, 93 were excluded as they did not meet the inclusion criteria. Twenty-nine for not utilizing an intervention, 24 due to being out of the scope of this study, 13 articles were excluded due to focus on medications, 8 for their focus on mental health, 7 for their qualitative design, 6 due to their systematic review design, 2 for not meeting the sample size criteria, 2 for not being published in English, and 1 for its focus on assessment instead of intervention. However, 1 article was also excluded due to replication from a previous search, resulting in a total of 5 articles. After review of the articles by our research team, 2 more articles were excluded. These articles were both excluded due to being out of the scope of this study. Three articles met the criteria to have their full text reviewed and evaluated for inclusion in the organizational framework.

The third search was carried out using the terms “musculoskeletal pain and rehabilitation”. A total of 77 articles were retrieved. From these article titles and abstracts, 71 were excluded as they did not meet the inclusion criteria. Thirty-seven for being out of the scope of this study, 11 for their exclusion of focus on chronic pain, 7 for lack of intervention utilized, 5 articles were excluded due to their systematic review design, 2 for focus on medications, 2 for not meeting the sample size criteria, 2 for their focus on mental health, 2 for their qualitative design, 1 for its focus on assessment instead of intervention, 1 for not being published in English, and one for its focus on physical

agent modalities. However, 1 article was also excluded due to replication from a previous search, resulting in a total of 5 articles. After review of the articles by our research team, 1 more article was excluded. This article was excluded due to it being out of the scope of this study and lack of similar research. Four articles met the criteria to have their full text reviewed and evaluated for inclusion in the evidence based-based table.

The fourth search was carried out using the terms “musculoskeletal pain, rehabilitation, and chronic pain”. A total of 17 articles were retrieved. From these article titles and abstracts, 16 articles were excluded as they did not meet the inclusion criteria. Eight articles were excluded because they were out of the scope of this study, 2 articles were excluded due to their qualitative design, 2 articles because of their lack of intervention, 2 due their systematic review design, 1 for its focus on medication, and 1 for its focus on mental health. However, the final article was also excluded due to replication from a previous search. This resulted in no articles to be reviewed.

The fifth search was carried out using the terms “allied health occupations and chronic pain”. A total of 6 articles were retrieved. From these article titles and abstracts, 6 articles were excluded as they did not meet the inclusion criteria. Three articles were excluded because of their qualitative design and the other 3 articles excluded because they were out of the scope of this study. This resulted in no articles to be reviewed.

The sixth search was carried out using the terms “chronic pain and upper extremity”. A total of 20 articles were retrieved. From these article titles and abstracts, 18 were excluded as they did not meet the inclusion criteria. Ten articles were excluded due to being out of the scope of this study, 4 for lack of utilizing an intervention, 2 due to their focus on medications, 1 for its focus on assessment instead of intervention, and 1 for

not being published in English. However, the final 2 articles were also excluded due to replication from a previous search. This resulted in no articles to be reviewed.

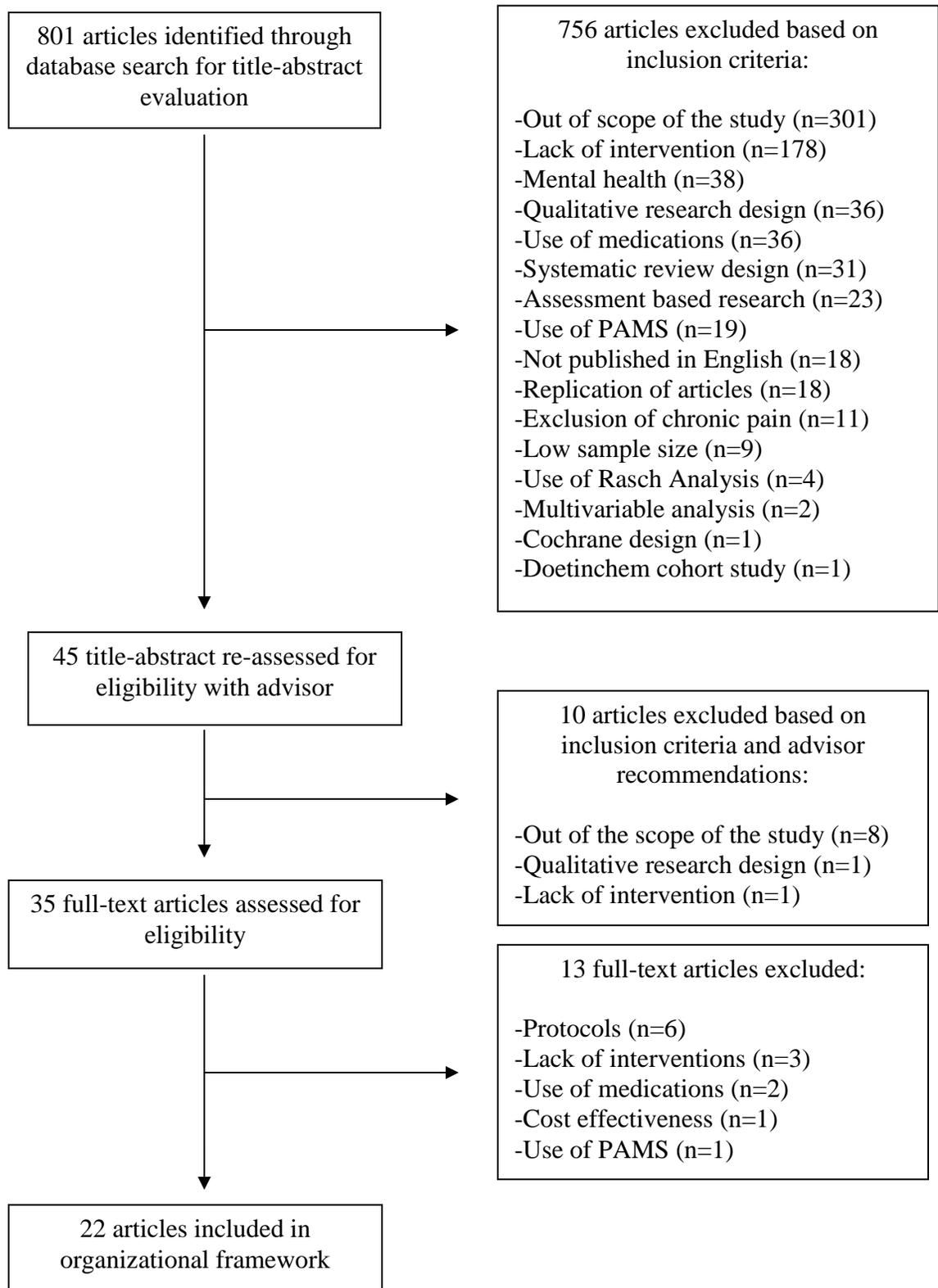
The seventh search was carried out using the terms “chronic pain and low back pain”. A total of 267 articles were retrieved. From these article titles and abstracts, 246 were excluded as they did not meet the inclusion criteria. A total of 107 articles were excluded due to being outside the scope of this study, 60 for their lack of intervention, 30 for their focus on medications, 12 for their focus on physical agent modalities, 9 for not being published in English, 9 for their systematic review design, 5 for their qualitative design, 5 for their focus on mental health, 2 for their focus on assessment instead of intervention, 2 for multivariable analysis approach, 2 for being a Rasch design, 1 for not meeting sample size criteria, 1 for its Cochrane design, and 1 for being a Doetinchem cohort study design. However, 13 articles were also excluded due to replication from previous search, resulting in a total of 8 articles. After review by our research team, 1 more article was excluded due to being out of the scope of this study. Seven articles met the criteria to have their full text reviewed and evaluated for inclusion in the evidence based-based table.

The eighth, and final, search was carried out using the terms “intractable pain and rehabilitation”. A total of 117 articles were retrieved. From these article titles and abstracts, 114 were excluded as they did not meet the inclusion criteria. Forty-eight articles because of their lack of intervention, 23 were excluded because they were out of the scope of this study, 11 for their focus on mental health, 10 for their focus on assessment instead of intervention, 10 due to their focus on medication, 4 were excluded due to their qualitative design, three due their systematic review design, 2 because of

their limited sample size being less than 10 subjects, 2 because of their use of physical agent modalities, and 1 for not being published in English. After review by the research team, 2 more articles were also excluded. One article was excluded due to its qualitative design, and the other article due to lack of intervention. One article met the criteria to have its full text reviewed and evaluated for inclusion in the organizational framework.

In total, 35 full text articles were reviewed and evaluated for inclusion in the study. From these articles, 13 were excluded as they did not meet the inclusion criteria. Six articles were excluded due to being protocols, three due to lack of intervention, two excluded due to focus on medication, one because of its focus on cost effectiveness, and one because of its focus on physical agent modalities. Twenty-two articles were retained and their content was put into the organizational framework. Figure 1 depicts the steps of the systematic review process.

Figure 1. Article Selection through the Systematic Review Process.



## **Ethics approval**

Because the systematic review did not involve recruitment or evaluation of any human subjects or protected data, no research ethics board assessment was needed.

## **Theory**

Throughout this study, we utilized an atheoretical approach due to a broad nature of a systematic review. *The Occupational Therapy Practice Framework – Domain and Process -2<sup>nd</sup> Edition* (American Occupational Therapy Association [AOTA], 2008a) was applied in order to capture the area of occupation and methods that we wanted to analyze. Specifically, the area of “Health Management and Maintenance” was chosen due to self-management being included within this area (AOTA, 2008a). Additionally, we sought to explore purposeful and occupational-based methods within research to examine available evidence-based interventions. As a result, we incorporated evidence-based practice to obtain research that supported effective methods for our target population (Law & MacDermid, 2014).

Chapter III consisted of implemented processes used to complete this systematic review. Chapter IV Results is comprised of summaries of the research selected for this systematic review.

## CHAPTER IV

### PRESENTATION, ANALYSIS, & INTERPRETATION OF DATA

Chapter IV consists of an overview of the research selected for review in this systematic review and is presented in an organizational framework designed to emphasize the major items of each research study. Factors in this framework included: the author/year, the objectives of the research study, the level of evidence, research design, and the number of subjects included per each designated study. In addition, this framework outlined the interventions utilized, the outcome measures, and the results of the research study. We found it important to note significant limitations of each research study to assess the characteristics that influence the application or the generalizability of the findings. As a result, this organizational framework was intended to serve as a guide for readers to examine further the research studies included in this systematic review.

The articles are organized by level of evidence from most rigorous to least. Degree of rigor refers to the ability of investigators to follow pre-constructed steps, rules, and procedures in order to lower the chances of error and decrease in credibility (Kielhofner, 2006). Articles that fall into a classification of being Level I are valid, randomized controlled trials (Lieberman & Scheer, 2002). These articles are considered “very strong” and have a high degree of rigor (Lieberman & Scheer, 2002). Level II is represented by evidence that is non-randomized with two groups having a pre-intervention and post-interventional study (Lieberman & Scheer, 2002). Level II of

evidence is found to be “less strong” and is lower in degree of rigor than an article in Level I. Level III evidence is categorized as having one group with a pre- and post-interventional study (Lieberman & Scheer, 2002). This level of evidence is seen to have less degree of rigor than Level I and II (Lieberman & Scheer, 2002). Level IV evidence is categorized as having a single-subject design and is considered to have a lower degree of rigor than Level I-III (Lieberman & Scheer, 2002). This can include retrospective, survey, and cohort designs (Lieberman & Scheer, 2002). Refer to Tables 1.1-1.15, 2.1-2.2, 3.1-3.3, and 4.1-4.2 to view the results.

Table 1.1

*Level I Research Study Synopsis*

<b>Author/ Year</b>	<b>Study Objectives</b>	<b>Level/Design/ Subjects</b>	<b>Intervention(s)</b>	<b>Outcome Measure(s)</b>	<b>Results</b>	<b>Study Limitations</b>
Abbasi, Dehghani, Keefe, Jafari, Behtash, & Shams (2012)	To investigate the efficacy of a spouse-assisted pain coping skills training (SA-CST) protocol for patients undergoing a multidisciplinary pain management programme (SA-MPMP), in addition to providing patients and spouses with educational information about chronic low back pain (CLBP) along with systematic training in cognitive and behavioral pain coping skills.	Level I (Randomized Control Trial)  N= 33 (Ages 18-70 years old, married, and referred to the pain clinic with CLBP for greater than 6 months.)	<u>Group 1:</u> Convention CST plus MPMP. Seven, weekly 2-hour sessions. Information given on: information, self-management, activity pacing, muscle, and relaxation. Asked to make goals at the end of each session.  <u>Group 2:</u> Spouse-assisted CST plus MPMP. Seven, weekly 2-hour sessions. Treatment was same as Group 1 with the exception that emphasis was put on the influence spouses can make and how the other spouse can influence them.  <u>Group 3:</u> Standard Medical Care. Continuation of routine treatment based on ordinary medical care.  All data was gained prior to intervention after the 7-week treatment, and 12-month follow-up.	Roland and Morris Disability Questionnaire (RDQ): Measured disability. Supported psychometric properties.  Visual Analog Scale (VAS): Measured pain intensity. Supported validity.  Tampa Scale of Kinesiophobia (TSK): Measured fear of (re)injury. Supported reliability.  Pain Catastrophizing Scale (PCS): Measured pain catastrophizing. Supported psychometric properties.  Depression, Anxiety, and Stress Scale (DASS): Measured depression experienced by subjects. Supported validity and reliability.  Marital Adjustment Test (MAT): Measured marital satisfaction between spouses. Supported validity, inter-item reliability, and test-retest reliability.	-Both group 1 & 2 improved in pain, disability, and secondary outcomes.  -The three groups did not differ statistically on any primary outcome measure.  -The SA-MPMP was more efficacious than two other interventions at post-treatment and 12 month follow-up.	The main limitation was that no data was collected from the spouses.  Gender distribution was not equal across groups.  Medical care was not standardized across groups, therefore some subjects may have received more of the intervention.  The research study has a small sample size, which limits the generalizability of the significant findings.

Table 1.2

*Level I Research Study Synopsis*

<b>Author/ Year</b>	<b>Study Objectives</b>	<b>Level/Design/ Subjects</b>	<b>Intervention(s)</b>	<b>Outcome Measure(s)</b>	<b>Results</b>	<b>Study Limitations</b>
Andersen, Andersen, Sundstrup, Jakobsen, Mortensen, & Zebis (2012)	To investigate the effect of neck/shoulder resistance training on pressure pain threshold (PPT) of painful neck/shoulder muscles and a non-painful reference muscle of the leg in adults with neck/shoulder pain.	Level I (Randomized Control Trial)  N=198 (Generally healthy adults with frequent neck/shoulder muscle pain, but without competing diseases or disorders that could give rise to hyperalgesia).	10 week program  <u>Group 1:</u> (n=66) 2 minutes of specific resistance training performed 5 times per week.  <u>Group 2:</u> (n=66) 12 minutes of specific resistance exercise performed 5 times per week.  <u>Group 3:</u> (n=66) Control group received weekly information on general health.	Use of electronic pressure algometer to measure PPT of the painful muscle (upper trapezius) and non-painful reference muscle (tibialis anterior).	-Increased PPT showed evidence of central adaptations of pain perception in response to musculoskeletal pain.  -Reducing pain in one region of the body evokes central desensitization.  -PPT of the painful trapezius muscle increased 11-13% in the training groups compared to Group 3. -2 minutes of exercise can modulate pain perception.	The main limitation is that there was only one reference site utilized.  A high rate of mortality at follow-up may have affected the results.

Table 1.3

*Level I Research Study Synopsis*

<b>Author/ Year</b>	<b>Study Objectives</b>	<b>Level/Design/ Subjects</b>	<b>Intervention(s)</b>	<b>Outcome Measure(s)</b>	<b>Results</b>	<b>Study Limitations</b>
Brooks, Kennedy, & Marshall (2012)	To compare changes in self-rated disability, pain, and anticipatory postural adjustments between specific trunk exercise and general exercise in individuals with chronic low back pain.	Level I (Randomized Controlled Trial) N=64 (Aged 18-50 years with ongoing recurrent lower back pain that is greater than 12 weeks.  <u>Group 1</u> : Specific Trunk Exercise Group (Pilates).  <u>Group 2</u> : General Exercise Group.	<u>Group 1</u> was an 8-week exercise program (Pilates), which incorporated skilled contraction techniques, trunk focused strengthening exercise, whole-body movements, and stretching of the trunk and hip musculature.  <u>Group 2</u> was an 8-week indoor stationary cycle training program.  All exercise sessions (both Group 1 & Group 2) lasted 50 to 60 minutes and were delivered 3 times per week.	Two self-reported scales were used before and after intervention: functional disability (using the Oswestry Low Back Pain Questionnaire) and pain levels (using the Visual Analog Scale).	-No differences were observed between the groups at baseline for any dependent variables.  -Disability and pain levels decreased significantly in Group 1, but were unchanged in Group 2.	The main limitation is that there was an absence of a long-term follow-up.  No reliability or validity of the instruments was reported.  A possibility of decreased inter-rater reliability between the exercise instructors and researchers delivering and assessing the interventions.

Table 1.4

*Level I Research Study Synopsis*

<b>Author/ Year</b>	<b>Study Objectives</b>	<b>Level/Design/ Subjects</b>	<b>Intervention(s)</b>	<b>Outcome Measure(s)</b>	<b>Results</b>	<b>Study Limitations</b>
Coppack, Kristensen, & Karageorghis (2012)	To examine the effects of a goal setting intervention on self-efficacy, treatment efficacy, adherence, and treatment outcome in patients undergoing a lower back pain rehabilitation program.	Level I (Randomized Control Trial) N=48 (Clinical diagnosis of chronic low back pain, referred for inpatient rehabilitation).	All groups had identical rehabilitation 30 minutes program for 5 days a week for 3 weeks.  <u>Group 1:</u> (n=16) Experimental group with goal setting and exercise therapy  <u>Group 2:</u> (n=16) Control group 1 (C1) with therapist-led exercise therapy. Therapists provided verbal encouragement.  <u>Group 3</u> (n=16) Control group 2 (C2) with non-therapist-led exercise therapy. Therapist only monitored for safety.	Sports Injury Rehabilitation Beliefs Survey (SIRBS): 19-item assessment used to measure self/treatment-efficacy. Given on days 1 and 15. Divergent validity.  Behavioral Regulation in Exercise Questionnaire (BREQ-2): Given on day 1 to use as a covariate for analysis.  Sports Injury Rehabilitation Adherence Scale (SIRAS): 3-item scale for practitioners to measure subjects' exertion, instruction following, and reception to change. High scores=higher adherence. High internal consistency, test retest reliability, inter-rater reliability, factorial validity, and construct validity of the SIRAS.  Biering-Sorensen: Measured treatment outcome. Found reliable to measure back extensor endurance. Valid outcome measure.  Relative Autonomy Index: Measured overall self-determination.	-Significantly higher adherence scores were found in Group 1 compared to Group 3.  -No significant difference Group 1 and Group 2 in adherence.  -Prolonged supervision was found to be vital in rehabilitation.  -Goal setting on measures of self-efficacy were significantly higher in the Group 1 compared to Group 2 + Group 3.  -No significant differences found in Biering-Sorensen test scores showing all treatments were equally effective.	The main limitation was that there were reduced sample sizes because of 3 groups, which limits generalizability.  There was no control for injury severity, or follow-up measure.  Threats to external validity and inter-rater reliability.  No reliability or validity was reported for the BREQ-2 or Relative Autonomy Index.

Table 1.5

*Level I Research Study Synopsis*

<b>Author/ Year</b>	<b>Study Objectives</b>	<b>Level/Design/ Subjects</b>	<b>Intervention(s)</b>	<b>Outcome Measure(s)</b>	<b>Results</b>	<b>Study Limitations</b>
Garcia et al. (2013)	To compare the effectiveness of Back School and McKenzie methods in patients with chronic nonspecific low back pain	Level I (Randomized Controlled Trial)  N=148 (Aged 18-80 years with nonspecific low back pain persisting at least 3 months).  <u>Group 1:</u> Back School intervention  <u>Group 2:</u> McKenzie intervention	A 4-week treatment program (one session per week) was based on the Back School (delivered to a group) or McKenzie (delivered individually) principles. In addition, the subjects were also instructed to perform a daily set of home exercises.	Pain intensity (measured by a 0-10 pain numerical rating scale); disability (measured by the 24-item Roland-Morris Disability Questionnaire); quality of life (measured by the World Health Organization Quality of Life-BREF instrument) and trunk flexion range of motion (measured by an inclinometer) at 1, 3, and 6 months after randomization.	-Subjects allocated to the McKenzie group had greater improvements in disability at 1 month, but not for pain intensity when compared with subjects allocated to the Back School group.	The main limitation was that the researchers did not monitor the home exercise program; therapists and subjects were not blinded.  The study had good levels of internal and external validity and thus can guide therapists and patients considering treatment options for back pain.  No reliability or validity on the instruments was reported.  A possibility of decreased inter-rater reliability between the two therapists delivering the intervention.

Table 1.6

*Level I Research Study Synopsis*

<b>Author/ Year</b>	<b>Study Objectives</b>	<b>Level/Design/ Subjects</b>	<b>Intervention(s)</b>	<b>Outcome Measure(s)</b>	<b>Results</b>	<b>Study Limitations</b>
Gram, Holtermann, Bultmann, Sjogaard, & Sogaard (2012)	To investigate whether an exercise intervention (to increase aerobic capacity) could affect musculoskeletal pain, work ability, productivity, perceived physical exertion, and sick leave. Also to compare data collection between questionnaires and text messages regarding work ability.	Level I (Randomized Control Trial)  N=67(More than 20 working hours per week, physically demanding tasks with high peak loads.)	<u>Group 1:</u> (n=35) Exercise group had on-site, 12 week programs with 3 sessions of 20 minutes per week with skilled instructors. Exercise plans were individually tailored. Exercise was written in training diary.  <u>Group 2:</u> (n=32) Control group was not offered exercise training but was given an hour lecture on general health promotion.	At baseline, and at a 12 week follow-up, measurements were taken. All questions were measured with the frame for interventions for preserved work ability, long-term effect (FINALE) questionnaire. In addition, pain intensity and work ability were reported by text messages.	-In both groups, no significant changes were found in musculoskeletal pain, work ability, productivity, perceived physical exertion, and sick leave.	The main limitation was that because there was a small sample size, there was no evidence to make significantly relevant changes in work ability, productivity, or sick leave.  Also, possible type 2 error may have occurred with the work ability analysis.  No reliability or validity was reported for the FINALE questionnaire.

Table 1.7

*Level I Research Study Synopsis*

<b>Author/ Year</b>	<b>Study Objectives</b>	<b>Level/Design/ Subjects</b>	<b>Intervention(s)</b>	<b>Outcome Measure(s)</b>	<b>Results</b>	<b>Study Limitations</b>
Kiyak (2012)	To evaluate the impact of wool underwear on pain in patients with chronic non-specific low-back pain.	Level I (Randomized Control Trial)  N=48 (18 years of age or older, no history of wearing wool, and no regular physical therapy for the 3 months prior to the start of study.)	<u>Group 1</u> (n=24) Treatment group was given woolen underwear to wear for two months.  <u>Group 2</u> (n=24) Control group was given 100% cotton underwear to wear for two months.	Visual Analog Scale: Measured subjective pain assessment on a 1-10 scale. Supported reliability and validity.  Oswestry Disability Index: Measured disability through 10 items with rankings of percentages. Higher percentages=greater disability.  Schober Test: Measured range of motion while bending forward.	-Post-test scores for pain level, Oswestry Disability Index, and Schober test measurements were significantly better in Group 1 compared to Group 2.  -Significant improvement in pain, flexibility, and disability levels were found for Group 1.  -It was hypothesized that increased heat allowed for reduced muscle tension and stiffness, which in turn decreased pain and disability.	The main limitation was that extraneous variables may have affected improvements among Group 1 and Group 2, which may have lowered external validity.  No reliability or validity was reported for the Oswestry Disability Index or the Schober Test.

Table 1.8

*Level I Research Study Synopsis*

<b>Author/ Year</b>	<b>Study Objectives</b>	<b>Level/Design/ Subjects</b>	<b>Intervention(s)</b>	<b>Outcome Measure(s)</b>	<b>Results</b>	<b>Study Limitations</b>
Nassif et al. (2011)	To evaluate the effectiveness of a specific workplace intervention at a car manufacturing company in workers in at-risk jobs who had chronic low-back pain (LBP).	Level I (Randomized Control Trial)  N=75 (Voluntary workers, 18 years and older, currently working in the assembly department, and experiencing chronic LBP.)	<u>Group 1</u> (n=37) Experiment group performed personally adapted, 60-minute sessions of physical therapy and physical exercise 3 times per week for 2 months fully supervised by an in-house physical-therapist.  <u>Group 2:</u> (n=38) Control group. No direct intervention but could consult externally.  Both groups also received medical and paramedical consultation on the benefits of physical activity and proper working posture positions as part of a global workplace policy and strategy.	Completed before intervention, 2 months after start, and 6 month follow-up.  Numerical Rating Scale (NRS): Used to measure subjective pain on a 0-10 scale.  Dallas Pain Questionnaire: Used to assess impact of pain on different activities.  Quebec Back Pain Disability Questionnaire/Roland Morris LBP and Disability Questionnaire (RMDQ): Used to measure impact of pain on daily life.  Tampa Scale for Kinesiophobia: Used to measure fear of movement.  Physical parameters: Measurement of hypoextensibility.  All measurements have been used and validated in previous studies.	-NRS scores significantly lowered in Group 1.  -Significant decrease found in Group 1 at 2 and 6 months on the Tampa scale.  -Significant decrease in RMDQ and Quebec assessments for Group 1.  -Both groups showed decrease in percentage on the Dallas Pain Questionnaire at 6 months.  -Regular leisure activity increased in both groups.  -Physical parameters showed a significant increase for Group 1 in quadriceps and hip flexors at 2 and 6 months.	The main limitation was that due to challenges in the environment, there was no patient blinding.  Social support may have increased motivation during the group intervention.  Also, a small sample size may have affected the results.

Table 1.9

*Level I Research Study Synopsis*

<b>Author/ Year</b>	<b>Study Objectives</b>	<b>Level/Design/ Subjects</b>	<b>Intervention(s)</b>	<b>Outcome Measure(s)</b>	<b>Results</b>	<b>Study Limitations</b>
Nicholas et al. (2013)	To compare an outpatient pain self-management program that included cognitive-behavioral therapy (CBT) and exercise. Researchers hypothesized that pain disability would be improved more by a pain self-management intervention than either weekly exercises or usual treatment and time.	Level I (Randomized Control Trial)  N=141 (Aged 65 years or over with a history of persisting, non-cancer pain for more than 6 months).  <u>Group 1:</u> Pain self-management group  <u>Group 2:</u> Exercise attention control group	Group 1 underwent eight 2-hour sessions on a twice-weekly basis for four weeks. All subjects were encouraged to perform the exercises and skills in treatment as well as at home between sessions. Skills taught included: setting specific, functional (and realistic) goals, activity pacing, dealing with flare-ups. Exercises taught included: stretching, aerobic and strengthening (walking, step-ups).  Intervention Group 2 underwent eight 2-hour sessions on a twice-weekly basis for four weeks. All exercises were the same as in Group 2, however no encouragement was given for home practice and no home exercise charts were provided.	Disability and quality of life (using the Roland & Morris Disability Questionnaire-Modified), physical performance test (distance walked in 6 minutes), depression (using the Depression Anxiety Stress Scale), and pain (using the Visual Analog Scale and the Pain Self-Efficacy Questionnaire) were assessed before the intervention, after intervention and at a 1-month follow up.  All outcome measures had strong psychometric properties.	Following the intervention, Group 1 made significant improvements compared to Group 2 in measures of pain distress, disability, depression, self-efficacy, and functional reach after a one-month follow-up.  These finding indicate that CBT-based pain self-management was more effective than exercises and usual care in reducing disability in community-dwelling older adults with chronic pain.	The main limitation was that the findings cannot be generalized to older people in pain who also have major cognitive and functional deficits.

Table 1.10

*Level I Research Study Synopsis*

Author/ Year	Study Objectives	Level/Design/ Subjects	Intervention(s)	Outcome Measure(s)	Results	Study Limitations
Pedersen, Andersen, Jorgensen, Sogaard, & Sjogaard (2013)	To investigate the effect of training dose on changes in musculoskeletal pain of female office workers in upper body and low back in response to 16 weeks of strength training.	Level I (Randomized Control Trial) N=549 (Women participating in previous reported randomized control study with specific strength training). <u>Group 1</u> : (n=180) for specific resistance training (SRT). <u>Group 2</u> : (n=187) all-round physical exercise (APE). <u>Group 3</u> (n=182) for reference intervention without physical activity (REF) (Control Group).	Group 1: Training scheduled 3 times per week for 20 minutes. Two of the three weekly sessions were supervised by experienced instructors. Mainly focused on dynamic strengthening shoulder exercises.  Group 2: Motivated to increase physical activity (PA) both at work and during leisure. Introduced to exercises by experienced instructors, made a contract, and included a mixture of activity (steppers, biking, aerobic fitness, etc.). Instructors were available 1 to 4 times per month.  Group 3: Main purpose was to receive attention like SRT and APE but not perform additional PA.	Group 1: Training was logged in diaries. Used to log load, sets, and repetitions.  -Training dose=load x sets x repetitions.  All groups were assessed using an internet-based questionnaire for pain index. Intensity of pain was recorded using 10-point Likert scale during the last 3 months. Have shown to be reliable and useful in longitudinal studies.	-Reductions in pain were greater in Group 1 and Group 2 compared with Group 3.  -A significant positive relationship was found between training volume per session and change in pain index for Group 2.  -The subjects with the highest total training volume and the greatest reductions in pain index also reported the highest training loads.  -There was a mean decrease of 32% on the pain index in the group with the highest training volume.  -Shoulder elevation strength improved 12% among women in Group 1 and 9% in Group 2 with no change in Group 3.	The main limitation was that there was minimal use of neck exercises included in the dose response analyses.  Limited association with group attendance may have affected the results because of extraneous variables.

Table 1.11

*Level I Research Study Synopsis*

<b>Author/ Year</b>	<b>Study Objectives</b>	<b>Level/Design/ Subjects</b>	<b>Intervention(s)</b>	<b>Outcome Measure(s)</b>	<b>Results</b>	<b>Study Limitations</b>
Roche-Leboucher et al. (2012)	To compare the effectiveness of a functional restoration program (FRP), including intensive physical training and a multidisciplinary approach, with an outpatient active physiotherapy program for patients with chronic low back pain.	Level I (Randomized Control Trial)  N=132 (Aged 18-50 years with a history of nonspecific chronic low back pain for at least 3 months and on sick leave or at risk of work disability.  <u>Group 1:</u> Functional Restoration Program (FRP)  <u>Group 2:</u> Active Individual Treatment (Control Group)	Group 1 (FRP) comprised of a 5-weekly, 6 hours a day, 5 days a week exercise program involving resistance exercises, endurance training, supervised weightlifting activities and work simulation workshops. Group 2 comprised of a 5-weekly, 1 hour a day, 3 days a week exercise program involving only active and isotonic exercises. Subjects were encouraged to perform home exercises for at least 50 minutes twice a week.	Assessed before intervention, at the end of 5 weeks of treatment and 12 months after treatment. The primary outcome was the reduction in the number of sick-leave days. Others included trunk flexibility, muscle endurance, the level of pain (using the Visual Analog Scale) and the Dallas Pain Questionnaire, which assessed the impact of pain on quality of life.	-Both groups at a 1-year follow-up significantly improved compared to baseline in the intensity of pain, flexibility, trunk muscle endurance, Dallas daily activities and work and leisure scores, and number of sick-leave days.  -The number of sick-leave days was significantly lower in Group 1 compared to Group 2.	The main limitation was that due to increased rates of mortality, the number of subjects is larger in Group 2 compared to Group 1. As a result, the between-group difference may have been underestimated.  No reliability or validity on the instruments was reported.

Table 1.12

*Level I Research Study Synopsis*

<b>Author/ Year</b>	<b>Study Objectives</b>	<b>Level/Design/ Subjects</b>	<b>Intervention(s)</b>	<b>Outcome Measure(s)</b>	<b>Results</b>	<b>Study Limitations</b>
Sherman et al. (2011)	To determine whether yoga was more effective than conventional stretching exercises or a self-care book for primary care patients with chronic low back pain.	Level I: (3-Arm Randomized Control Trial) N=228  <u>Group 1:</u> Yoga intervention  <u>Group 2:</u> Stretching intervention  <u>Group 3:</u> Self-help book intervention	A series of 12 standardized weekly 75-minute yoga (Group 1) and stretching (Group 2) classes, designed for people with chronic low back pain unaccustomed to yoga or stretching was delivered. Subjects were asked to practice 20 minutes on non-class days and were given handouts and compact disks (yoga) or digital versatile disks to assist in this. Group 3 subjects received a back pain help book only, which provided information on how to manage the symptoms associated with chronic low back pain.	Telephone interviews were conducted at baseline, and at 6, 12 and 26-weeks post randomization. Primary outcomes included disability (by using the Roland-Morris Disability Questionnaire) and pain level (using a self-rated symptom bothersomeness on a 0 to 10 scale). Secondary outcomes included activity restriction, patient global rating of improvement and patient satisfaction.	-Group 1 and Group 2 subjects were significantly more likely to rate their back pain as better, much better, or completely gone at all follow-up times compared to those in Group 3.	The main limitation was that disappointed subjects in Group 3 may have been more likely to report worse outcomes.  The amount of stretching performed in Group 2 was substantially greater than typically found in publically available classes.  No reliability or validity of the instruments was reported.

Table 1.13

*Level I Research Study Synopsis*

<b>Author/ Year</b>	<b>Study Objectives</b>	<b>Level/Design/ Subjects</b>	<b>Intervention(s)</b>	<b>Outcome Measure(s)</b>	<b>Results</b>	<b>Study Limitations</b>
Thorsell et al. (2011)	To compare the effectiveness of 2 manual-based self-help interventions including an acceptance-oriented treatment (ACT) and a controlled-oriented treatment (Applied Relaxation) for persons with chronic pain.	Level I: (Randomized Control Trial) N=90 (Persons with chronic pain)  <u>Group 1:</u> ACT intervention.  <u>Group 2:</u> Applied Relaxation (AR) intervention. (Control Group).	Both interventions entailed an initial face-to-face session, 6 telephone sessions, and 1 concluding face-to-face session. Group 1 (ACT) comprised of a 90-minute face-to-face session, identifying short- and long-term effects within 4 domains (work, leisure, relationships and health). Subjects were given a self-help manual and compact discs with supplementary exercises. Group 2 (AR) comprised of a 90-minute face-to-face session using progressive muscle relaxation techniques. Subjects were given a self-help manual and compact disks with supplementary exercises. Subsequent weekly telephone sessions (30 minutes long) were used in both groups to provide subjects to discuss their progress.	Assessments included before and after intervention were measures of satisfaction (using the Satisfaction with Life Scale), depression (using the Hospital Anxiety and Depression Scale), and level of function and pain intensity (using the Orebro Musculoskeletal Pain Questionnaire).  The Satisfaction with Life Scale had good validity and internal consistency.  The Hospital Anxiety and Depression Scale had good internal consistency.	-Group 1 (ACT) showed increases in satisfaction with life and level of function and a decrease in pain intensity compared to Group 2 (AR).  -Subjects in both groups improved regarding depression and anxiety.	The main limitation was that there was an absence of a long-term follow-up.  A possibility of decreased inter-rater reliability between the therapists delivering and assessing the interventions.  No reliability or validity was reported on the Orebro Musculoskeletal Pain Questionnaire.

Table 1.14

*Level I Research Study Synopsis*

<b>Author/ Year</b>	<b>Study Objectives</b>	<b>Level/Design/ Subjects</b>	<b>Intervention(s)</b>	<b>Outcome Measure(s)</b>	<b>Results</b>	<b>Study Limitations</b>
Vasseljen, Unsgaard-Tondel, Westad, & Mork (2012)	To investigate feed-forward activation or timing of abdominal muscle activation in response to rapid shoulder flexion after 8 weeks with core stability exercise, sling exercises, or general exercises in chronic nonspecific low back pain (LBP) patients.	Level I (Randomized Control Trial)  N=109 (Aged 18-60 years with chronic nonspecific low back pain of a least 3 months' duration.)  <u>Group 1:</u> Core Stability Exercise intervention.  <u>Group 2:</u> Sling Exercise intervention.  <u>Group 3:</u> General Exercise intervention. (Control Group)	Group 1 comprised of an 8-weekly core abdominal exercise course lasting 40 minutes. The subjects were encouraged to perform 10 pain-free abdominal contractions 2 to 3 times per day, holding each contraction for 10 seconds. Group 2 comprised of an 8-weekly exercise course lasting 40 minutes, where elastic bands were attached to the pelvis to help maintain neutral spine position at all times during the exercise program. Group 3 comprised of an 8-weekly general strengthening and stretching exercises lasting 60 minutes as recommended in the treatment of nonspecific LBP.	The primary outcomes were the change in onset of the deep abdominal muscles in response to unilateral rapid shoulder flexion as well as looking at back pain (using the Numerical Rating Pain Scale). These were assessed before and after intervention.	-No, or only small, changes were found in mean onset after treatment in the 3 intervention groups.  -No overall improvement in abdominal muscle onset was found after 8 weeks of different exercises.  -No association was found between changes in pain in the intervention period.	The main limitation was that the researchers' instrumentation may not be as reliable and valid.  The high rate of mortality in the control group may have affected the results.  No reliability or validity on the instruments was reported.

Table 1.15

*Level I Research Study Synopsis*

<b>Author/ Year</b>	<b>Study Objectives</b>	<b>Level/Design/ Subjects</b>	<b>Intervention(s)</b>	<b>Outcome Measure(s)</b>	<b>Results</b>	<b>Study Limitations</b>
Wong et al. (2011)	To evaluate the effectiveness of the Mindfulness-based Stress Reduction (MBSR) program as compared with a multidisciplinary pain intervention (MPI) strategy.	Level I (Randomized Comparative Trial)  N=99 (Aged 18-65 years with the presence of chronic pain, which had persisted for at least 3 months indicated at the moderate-to-severe level using the Numerical Rating Pain Scale (NRPS).)  <u>Group 1</u> : MBSR intervention.  <u>Group 2</u> : MPI intervention (Control Group).	Group 1 (MBSR) was comprised of 8 weekly group sessions, each of 2.5 hours involving mindfulness, relaxation groups, meditation, yoga and supportive group meetings. Subjects were given a booklet and compact discs that guided them through the mindfulness exercises which they were instructed to practice daily.  Group 2 comprised of 8 weekly, 2.5 hour group sessions in the form of instructional lectures on the basic understanding of chronic pain, the factors associated with chronic pain, and effective ways subjects could signal their chronic pain to others.	Collected at baseline, at 8 weeks (immediately after intervention) and 3 months and 6 months after intervention. Measures included NRPS and health-related quality of life using the Medical Outcomes Study Short-Form Health Survey (SF-12).  All outcome measures had strong psychometric properties.	-No significant differences were observed between Group 1 (MBSR) and Group 2 (MPI). However, overall, all subjects demonstrated significant improvements in pain intensity and pain-related distress.	The main limitation was that due to high rates of mortality, the researchers' sample size might not have been large enough to show significant differences in outcome measures between the 2 groups.  Present was a possibility of decreased inter-rater reliability between the two therapists delivering the interventions for each group.

Table 2.1

*Level II Research Study Synopsis*

<b>Author/ Year</b>	<b>Study Objectives</b>	<b>Level/Design/ Subjects</b>	<b>Intervention(s)</b>	<b>Outcome Measure(s)</b>	<b>Results</b>	<b>Study Limitations</b>
Baena-Beato, Arroyo-Morales, Delgado-Fernandez, Gatto-Cardia, & Artero (2013)	To study the effects of an 8-week aquatic therapy program with a frequency of 2 and 3 days per week on pain, disability, quality of life and health-related fitness in men and women with self-reported chronic low back pain.	Level II (Non-Randomized Control Trial – 2 groups) N=74 (aged 18-65 years with presence of self-reported low back pain for more than 12 weeks).  <u>Group 1:</u> Experimental group 2 days (EG2d) per week.  <u>Group 2:</u> Experimental group 3 days (EG3d) per week.  <u>Group 3:</u> Waitlist group-usual care (Control group).	An 8-week aquatic therapy program consisting of 16 and 24 sessions in EG2d and EG3d respectively and no exercise sessions in the control group. Each session included 10 minutes of warm-up, 15-20 minutes of resistance exercise, 20-25 minutes of aerobic exercise, and 10 minutes of cool down (stretching exercises).	All subjects attended two initial measurement sessions, in which back pain, disability, quality of life, body composition, and health-related fitness were measured at the beginning of and immediately after the exercise therapy intervention.  Subjects used the Rating of Perceived Exertion (RPE) scale from 6 to 20 to control the intensity of the aerobic exercises.	-An aquatic therapy program performed 3 days per week had greater improvements in pain in flexion, disability and heart rate at rest and post effort than 2 days per week from baseline.  -There was significant improvement in all outcome measures in EG2d and EG3d compared to the control group.	The main limitation was that the researchers did not randomize subjects into the intervention or usual care group, therefore selection bias could have influenced the study findings.  Long-term outcomes measurements were not performed in these subjects, so it cannot be determined if the effect of the treatment can be maintained over time.  No reliability or validity of the instruments was reported.

Table 2.2

*Level II Research Study Synopsis*

<b>Author/ Year</b>	<b>Study Objectives</b>	<b>Level/Design/ Subjects</b>	<b>Intervention(s)</b>	<b>Outcome Measure(s)</b>	<b>Results</b>	<b>Study Limitations</b>
Marshall, Desai, & Robbins (2011)	To investigate trunk muscle activity during several commonly performed rehabilitation exercise in individuals with and without chronic lower back pain. A secondary purpose was to investigate the extent to which abdominal bracing affected muscle activity during exercise in both groups.	Level II: (Non-Randomized Control Trial – 2 groups). N=20  <u>Group 1:</u> Chronic, nonspecific lower back pain group.  <u>Group 2:</u> An age, height and weight matched group of healthy controls (Control group).	All subjects attended 2 sessions separated by 7 days. The first was a familiarization session (education and instruction on exercise and the abdominal bracing technique). The second session included testing each exercise with and without abdominal bracing. The 5 exercises included: quadruped, side bridge, modified push-up, squat and shoulder flexion.	Trunk muscle activity using electrodes and lumbar range of motion were measured during all exercises.	-No subjects had a worsening of symptoms during the study. This indicated that the exercise tasks may be useful as all 5 exercise tasks did not aggravate the subjects' condition or confound results.  -The results of this study provided information about how individuals with chronic non-specific lower back pain perform core stability exercises.	The main limitation was that the researchers did not randomize subjects into the intervention or usual care group, therefore selection bias could have influenced the study findings.  A possibility of decreased inter-rater reliability between the therapists delivering and assessing the intervention.  No reliability or validity of the instruments was reported.

Table 3.1

*Level III Research Study Synopsis*

<b>Author/ Year</b>	<b>Study Objectives</b>	<b>Level/Design/ Subjects</b>	<b>Intervention(s)</b>	<b>Outcome Measure(s)</b>	<b>Results</b>	<b>Study Limitations</b>
Beladev & Masharawi (2011)	To investigate the effect of active group-exercising in women with non-specific chronic low back pain (NSCLBP) in a sitting position and to analyze the relationship between lumbar range of motion, self-rated pain and functional disability.	Level III (Pilot Study) N=25 (Females aged 45-65 years with complaints of lower back pain for at least 12 weeks.)	All subjects underwent a group sitting exercise session of 45 minutes over an 8-week period. The protocol included 10 repetitions of each exercise, including: breathing control, lumbar rotation, side flexion, flexion and extension, pelvic tilts, unilateral rotations, elevations, as well as lumbar and pelvic stabilizing exercises.	Three sets of lumbar measurements (one measurement prior, during and six weeks after intervention) were attained through use of the Back Range of Motion II (BROM-II).	-Lumbar flexion and extension significantly increased, compared to baseline. -Flexion improved 3.9 degrees (in 28% of subjects), and extension increased 3.9 degrees (in 55% of subjects) following intervention. -Visual Analog Scale (VAS) following intervention significantly reduced compared to baseline.	The main limitation was that the study did not have a control-group and the sample size was limited.  The results in lumbar extension did not exceed what the researchers had initially hypothesized.  No reliability or validity of the instruments was reported.

Table 3.2

*Level III Research Study Synopsis*

<b>Author/ Year</b>	<b>Study Objectives</b>	<b>Level/Design/ Subjects</b>	<b>Intervention(s)</b>	<b>Outcome Measure(s)</b>	<b>Results</b>	<b>Study Limitations</b>
Cassidy, Atherton, Robertson, Walsh, & Gillett (2012)	To determine whether self-reported mindfulness improved after a cognitive-behavioral biopsychosocial intervention for chronic pain. To offer an explanation as to whether relationships between mindfulness and physical functioning or depression were mediated by catastrophizing.	Level III (Cross-sectional and Longitudinal data collection)  N=116 (Subjects who had back pain for at least 9 months and their disability was primarily caused by lumbosacral pain).	A pain management program entitled 'Back Pain Unit' was attended for 7 hours on one day of each of 9 consecutive weeks.  Sessions included: anatomy, goal setting, graded exercise and pacing, stress management, relaxation and imagery, challenging negative thoughts, and communication skills, and medication usage (not focused on in study). A single 1 hour session introducing mindfulness was also attended by subjects.	Questionnaire packs comprised of self-report measures for pain severity, disability, psychological functioning, pain catastrophizing, and mindfulness. Comprised of robust, well-validated self-report measures.  Mindful Attention Awareness Scale: 15 items to assess present moment attention. Well established validity and reliability.  SF-8 Health Survey: Measured pain severity.  Roland and Morris Disability Questionnaire: Measured impact of pain on daily activities.  Pain Catastrophizing Scale: 13 items to measure pain catastrophizing. Supported with good reliability and validity.	-Self-reported mindfulness increased after participation in a tradition cognitive-behavioral pain management program.  -Increased mindfulness over time showed improvements in disability and psychological functioning.  -Greater mindfulness was associated with less catastrophizing.  -Being mindful helped to relinquish negative thoughts and/or catastrophizing.	The main limitation was that the researchers used only 2 time points to take measurements, which may have affected results.  Also, there was no randomization of the order of the questionnaires.  No reliability or validity was reported for the SF-8 Health Survey or the Roland and Morris Disability Questionnaire.

Table 3.3

*Level III Research Study Synopsis*

<b>Author/ Year</b>	<b>Study Objectives</b>	<b>Level/Design/ Subjects</b>	<b>Intervention(s)</b>	<b>Outcome Measure(s)</b>	<b>Results</b>	<b>Study Limitations</b>
Reneman, De Vries, Van Den Hengel, Brouwer, & Van Der Woude (2012)	To investigate whether physical activity (PA) levels and day patterns of sick-listed workers with chronic non-specific musculoskeletal pain (CMP) admitted for multidisciplinary rehabilitation were different from those workers with CMP.	Level III (Cross-sectional)  <u>Group 1:</u> (n=27) (Greater than 3 months CMP without medical cause, age 18-65 years, paid work greater than 20 hours/week, and sick-listed currently and for greater than 5% during the previous year.)  <u>Group 2:</u> (n=107) (Dataset used of volunteers with CMP who did not have rehabilitation, no current sick-listing, and total sick-listing of less than 5% in previous year.)	Subjects wore triaxial RT3 accelerometer for 5-7 consecutive days. At least 2 of those days were working days. Subjects completed a diary to compare with the accelerometer data.	Triaxial RT3 accelerometer to measure the mean acceleration of movements in vertical, anteroposterior, and mediolateral axes. Supported by sufficient validity/reliability.  Visual Analog Scale (VAS): Measured subjective pain assessment for sick-listed group.  Numeric Rating Scale (NRS): Measured subjective pain assessment for working group.	-Worker's mean PA level throughout the day was 31% higher than the sick-listed patients.  -There was a decrease of PA in both groups.  -A constant PA day pattern may not be preferable or a means to restore disability and participation.	The main limitation was that due to a small sample size and the research design, it is difficult to make assumptions about the study.  Due to regression, internal validity likely decreased, which may have affected the results.  No reliability or validity was reported for the VAS or NRS.

Table 4.1

*Level IV Research Study Synopsis*

<b>Author/ Year</b>	<b>Study Objectives</b>	<b>Level/Design/ Subjects</b>	<b>Intervention(s)</b>	<b>Outcome Measure(s)</b>	<b>Results</b>	<b>Study Limitations</b>
Law, Murphy, & Palermo (2012)	To examine participation in an Internet program by families assigned to the Internet intervention arm of a randomized controlled trial To examine the external support component of the Internet program by evaluating whether the content of messages sent by subjects (to the coach) were associated with treatment outcomes of pain and activity limitations.	Level IV (Subsequent Analysis to RCT)  N=26 (Referred from pediatric specialty care physicians, 11-17 years old, with chronic pain.)	8-10 week program with 8 modules including: education, recognizing stress/negative emotions, relaxation, distraction, cognitive skills, lifestyle factors, increasing physical activity, maintenance and relapse prevention. Also included parental modules. An online coach was available to respond using standard manualized answers.	Logins to program. Word count of interactive fields.  Behavioral assignments: Six assignments were available to be completed.  Messages: Total number sent to online coach. Separated into treatment, technical issues, and rapport.	-Treatment messages were significantly related to pain intensity change scores.  -No relationship was found between rapport messages and change in pain intensity.  -There was a high level of participation in program as evidenced by the number of logins.  -The greater pre to post treatment changes were achieved by those with worse initial pain and functional disability perhaps due to enhanced motivation to participate in program.  -Individuals with higher pain were more prone to interact with the online coach.  -An online coach may enhance treatment outcomes.	The main limitation was that because of a small sample size the results are difficult to generalize.  Also, subjects receiving compensation may have affected the results.  Secondary analysis to RCT.

Table 4.2

*Level IV Research Study Synopsis*

<b>Author/ Year</b>	<b>Study Objectives</b>	<b>Level/Design/ Subjects</b>	<b>Intervention(s)</b>	<b>Outcome Measure(s)</b>	<b>Results</b>	<b>Study Limitations</b>
Parker et al. (2011)	To compare the effects of the Arthritis Foundation Self-Help Program (ASHP) on groups of older Hispanic, African American, and non-Hispanic whites.	Level IV (Survey) N=94 (60 years of age or older, have self-identified pain disorder, and fluent in Spanish/English)	Six weekly classes (2 hours each). Modules including: education, relaxation training, cognitive coping skills, problem solving, and communication skills. Subjects created weekly action plans to learn goal setting skills and improve self-efficacy. The Spanish program differed from the English program through use of in group exercises and two instructional compact discs for home use.	37-item, self-administered Arthritis Foundation pre and post course assessment.	-All 3 groups had significant decrease in pain intensity.  -Significant improvements in mood were found for non-Hispanic whites and Hispanic subjects.  -Hispanic subjects showed increased confidence.  -Substantial increases in all groups for use of exercises.	The main limitation was that compensation was given to increase attendance to limit mortality.  There was decreased inter-rater reliability between the Spanish and English programming.

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Chapter IV consisted of synopses of research studies that met the inclusion criteria and were presented in the order of research rigor (most rigorous to least rigorous). The final selection of articles that were reviewed consisted of 15 Level I research studies, 2 Level II research studies, 3 Level III research studies, and 2 Level IV research studies. The synopses provided in this organizational framework will be further examined and interpreted in Chapter V. Furthermore, Chapter V will focus on the interconnections between resulting findings in order to extend clinically relevant conclusions related to occupational therapy practice.

## CHAPTER V

### SUMMARY, CONCLUSIONS, & RECOMMENDATIONS

Relief of pain, especially chronic pain, is necessary in order to participate fully in daily occupations and influences health and well-being. However, there is limited summarized research exemplifying interventions for individuals with chronic pain. More specifically, there is a lack of occupation-based interventions that are supported by evidence that can be prescribed by occupational therapists and carried out by individuals with chronic pain. This systematic review consists of current, evidence-based interventions for individuals experiencing chronic pain. Additionally, this research study creates the opportunity to guide health care providers in professional practice. As a result, the findings of this study can help better understand effective interventions for the profession of occupational therapy and provide direction for further research in the area of chronic pain.

#### **Implications**

Occupational therapy interventions are used in the treatment of clients with chronic pain as they are intended to reduce the influence of pain on occupational performance and disability, in addition to modify home and work environments to reduce and/or prevent pain (Skjutar, Schult, Christensson & Müllersdorf, 2010). Therefore, examining the results of this systematic review in detail is essential to provision of effective delivery of occupational therapy. Based on the findings of this study, we

grouped the articles from the organizational framework into three different categories in this concluding discussion: low back pain, upper extremity, and general musculoskeletal chronic pain.

This systematic review revealed a majority of interventions focused on chronic low back pain. A main implication is that although the level of disability decreased among subjects experiencing low back pain, there was no significant difference in pain levels between interventions provided as home exercise programs individually and in groups (Garcia et al., 2013). This demonstrates that the method of delivery of services may not influence the level or the quality of the pain experienced by individuals. However, through collaboration between the client and the therapist, goal setting can have positive effects in the therapeutic process, which can contribute to higher self-efficacy and adherence with specific interventions (Coppack, Kristensen, & Karageorghis, 2012). Additionally, education and instruction on interventions may help maintain quality of life in individuals with chronic pain, as well as reduce the onset of pain in the general population (Marshall, Desai, & Robbins, 2011). Therefore, occupational therapists need to be knowledgeable about creating positive therapeutic rapport in which reciprocal understanding of the goals and direct intervention process exists. Occupational therapists working with other allied health providers also need to consider intervention strategies that reduce pain among individuals with chronic low back pain.

A multidisciplinary approach is necessary when considering effective delivery of health care services. It was found that when a multidisciplinary approach was utilized, subjects with chronic low back pain improved significantly with a decreased intensity of

pain (Baena-Beato, Arroyo-Morales, Delgado-Fernandez, Gatto-Cardia, & Artero, 2013; Nassif et al., 2011; Roche-Leboucher et al., 2011; Sherman et al., 2011), increased flexibility (Roche-Leboucher et al., 2011; Sherman et al., 2011), and improved truck muscle endurance (Beladev & Masharawi, 2011; Roche-Leboucher et. al., 2011). There are other intervention opportunities that resulted in decreased low back pain in individuals. Kiyak (2012) found that incorporating wool underwear reduced the effects of chronic, non-specific low back pain due to the availability of increased heat, which in turn allowed for reduced muscle tension and stiffness. Additionally, yoga (Sherman et al., 2011), a 3-day aquatic program (Baena-Beato et al., 2013), and a physical exercise program instructed by a physical therapist (Nassif et al., 2011) have been shown to lower the level of pain experienced throughout the day and improve overall disability and health-related fitness of clients. In addition to understanding these intervention strategies, it is also important to consider how to implement those interventions in clinical practice.

Occupational therapists and allied health providers may have to consider variations in delivering interventions for chronic low back pain. Pedersen, Andersen, Jorgensen, Sogaard, and Sjogaard (2013) described that those individuals receiving higher training loads (increased number of therapy sessions) may show less musculoskeletal, upper extremity, and lower back pain. Therefore, modification of existing interventions, based on the individual client's response, within the treatment session will also be essential. For example, Beladev and Masharawi (2011) identified that completing exercises in sitting might improve lumbar flexion and chronic low back pain. Additionally, engaging in mindfulness and limiting pain catastrophizing (which

decreased physical dysfunction) showed positive results (Cassidy, Atherton, Robertson, Walsh, & Gillett, 2012). As a result, occupational therapists and other allied health providers must consider these strategies for individuals with low back pain when designing therapeutic treatment plans.

This systematic review also revealed positive therapeutic outcomes for individuals experiencing upper extremity dysfunction. Andersen, Andersen, Sundstrup, Jakobsen, Mortensen, and Zebis (2012) and Pedersen et al (2013) found that resistance training was effective in reducing the symptoms of pain found in the upper extremity and body. Vasseljen, Unsgaard-Tondel, Westad, and Mork (2012) found that through different forms of exercises, using abdominal muscles, did not have any effect on the symptoms or deduction of pain. Additionally, research from Pedersen et al (2013) showed that more research is needed to examine the effectiveness of core stability exercises and its effect on the relief of chronic pain. Consequently, occupational therapists and allied health providers need to further examine the use of resistance exercises for individuals who are experiencing pain in order relieve symptoms and enhance health and well-being. Furthermore, due to the limited findings on interventions for upper extremity chronic pain, more research is needed in the profession of occupational therapy, as well as in other allied health professions.

Occupational therapists and allied health providers can also assist individuals experiencing musculoskeletal chronic pain in identifying strategies to decreasing pain and improving quality of life. It was found that a more tailored approach, incorporating work, leisure, relationships, and health enhanced subjects level of satisfaction with life, improved individuals' level of overall daily function, and helped decrease their pain

compared to using progressive muscle relaxation alone (Gram, Holtermann, Bultmann, Sjogaard & Sogaard, 2012; Thorsell et al., 2011). This holistic approach was also shown to be effective when used in combination with a mindfulness program (Wong et al., 2011). In addition, having an online coach through an internet-based program may enhance treatment outcomes (Law, Murphy & Palermo, 2012). As a result, occupational therapists and allied health providers can utilize these methods to help guide treatment for individuals with musculoskeletal pain. A critical review of literature also revealed other effective interventions for addressing the needs of individuals with chronic pain.

Nicholas and colleagues (2013) concluded that use of a cognitive-behavior-treatment pain self-management program was more effective than exercises alone in reducing disability in community-dwelling older adults with chronic pain. This finding suggests that occupational therapists and allied health providers may have to adapt their treatment strategies to different client populations. Moreover, an arthritis foundation self-help program, involving education, relaxation training, and cognitive coping skills was found to decrease pain intensity among older Hispanics, African-American, and non-Hispanic Whites (Parker, 2011). By considering the varying physical characteristics and different cultural backgrounds, occupational therapists and allied health providers can enhance clients' outcomes for daily participation in meaningful activities, including work.

In this systematic review, two articles that addressed the influence of chronic pain and sustaining employment were reviewed. Content from these articles provided multiple examples of recommendations for occupational therapists to implement because interventions addressing return to work are within the occupational therapy scope of

practice. Reneman, De Vries, Van Den Hengel, Brouwer, and Van Der Woude (2012) found that individuals with chronic non-specific low-back pain who stayed at work had increased physical activity when compared to those who stayed at home in order to recuperate. Evaluation and thorough communication is needed between occupational therapists and their clients in order to gauge the physical activity that is found at the client's job and to determine whether returning to work is appropriate. If the client's job has an acceptable amount of rest period within the job, the occupational therapists can provide recommendations as to what adaptations can be done at work in order to decrease symptoms of the client's lower-back pain.

In addition to maintaining employment, occupational therapists and allied health providers appear to understand the benefit of having a positive support system throughout recovery. Abbasi, Dehghani, Keefe, Jafari, Behtash, and Shams (2012) examined specifically the effects of a spouse-assisted program. It was found that having a spouse assist the client in a chronic low back pain program with different elements of therapy provided a decrease in the client's overall pain symptoms and an increase in his or her ability to cope with the pain (Abbasi et al., 2012). This shows that incorporating spouses into the therapy regiment may have a greater impact than teaching the client alone. More research is needed to discover the effects of incorporating other supports, such as family and friends, in therapeutic process.

## **Surprises**

Several surprises occurred throughout the research process. One of these surprises included the number of Level I studies that have been carried out in the past. Of the 22 articles included in our study, 15 were within the first level of evidence. With the

noted lack of research on the topic of chronic pain, we found that it was surprising that there were not more published research articles that could be categorized in a lower level of evidence. Articles that fall into a classification of being Level I are valid, randomized controlled trials (Lieberman & Scheer, 2002). Level I studies are considered to be “very strong” and have a high degree of rigor (Lieberman & Scheer, 2002). However, we believe that if there are several articles written within Level I, that more research can be carried out in lower levels in order to target specific areas of need for management of chronic pain. This, in turn, will then allow studies with higher rigor to be carried out on those specific topics of need.

The next surprise was the lack of variety in the populations with chronic pain diagnoses that had been examined in research. As stated previously, several of the authors examined the effects of chronic lower back pain. Although this specific diagnosis is growing in frequency, it is not the only disorder that can lead to chronic pain. Chronic pain can be found within upper extremities including the shoulder, elbow, and hand; arthritis; and tendonitis. Some articles were found to focus on neck and cervical chronic pain; however, these conditions are more in the scope of practice for physical therapists.

Along with a lack of research regarding specific populations of diagnoses with chronic pain, there were also differences between the age ranges of populations utilized in different studies. During the systematic review process, only a few articles were found pertaining to pediatrics and older adults. This was a surprise since research has found that 50% of older adults who reside in their own homes, along with 75-85% who reside in nursing homes or other care facilities, suffer from chronic pain (National Institute of

Health [NIH], 2011b). Although this is a large percentage of the older adult population, chronic pain is largely undertreated (NIH, 2011b).

There was only one article in the organizational framework that focused on adolescents ages 11-17 years (Law et al., 2012). Law et al. (2012) were also the only authors to examine the influence of utilizing an internet-based coach. The American Pain Society (2012) reported that 20-35% of children, ages 0-18 years old throughout the world are affected in some way by chronic pain. With chronic pain having this high of an influence on children and adolescents, it was a surprise that more literature had not been published on a younger population.

Another surprise was the variety of interventions that were found within the articles included in the organizational framework. These studies varied from the effects of wool underwear on chronic pain (Kiyak, 2012) spouse-assisted intervention groups (Abbasi et al., 2012) to having the individual learn in a group setting with an instructor (Abbasi et al., 2012; Beladev, & Masharawi, 2011; Brooks, Kennedy, & Marshall, 2012; Cassidy et al., 2012; Coppack et al., 2012; Garcia et al., 2013; Gram et al., 2012; Law et al., 2012; Marshall et al., 2011; Nassif et al., 2011; Parker et al., 2011; Pedersen et al., 2013; Roche-Leboucher et al., 2011; Sherman et al., 2011; Thorsell et al., 2011; Vasseljen et al., 2012; Wong et al., 2011). These interventions differed from what we anticipated we would find in the literature.

Another factor that was found while reviewing the research articles was the utilization of data from subjects in previous studies (Pedersen et al., 2013; Reneman et al., 2012). This approach is considered retrospective in nature and reduces the ability of researchers to limit the confounding factors that may influence study results (Classen,

2006). Studies specifically designed from their conception to gather data related to research questions regarding chronic pain would likely result in more accurate results that could be implemented in practice.

The lack of published research regarding interventions that could be used as home programs was another major surprise. Self-management is defined as the capability of the client to work with all facets that a chronic illness involves, such as symptoms, interventions of treatment, physical and social consequences, and daily life changes (Coleman & Newton, 2005). A group of the articles reviewed and included in the organizational framework pertained to an obligation of attending some sessions in order to gain knowledge on chronic musculoskeletal pain in order to implement that information into a home routine (Andersen et al., 2012; Baena-Beato et al., 2013; Beladev & Masharawi, 2011; Cassidy et al., 2012; Coppack et al., 2012; Garcia et al., 2013; Gram et al., 2012; Kiyak, 2012; Law et al., 2012; Marshall et al., 2011; Nassif et al., 2011; Parker et al., 2011; Pedersen et al., 2013; Vasseljen et al., 2012; Wong et al., 2011).

However, some of the studies showed specific exercises that could be incorporated into a self-management home program through selection and demonstration of the occupational therapist or allied health provider. Successful self-management programs rely on dedicated individual compliance (World Health Organization [WHO], 2003). From the organizational framework, interventions can be utilized that were found to help lower symptoms of chronic musculoskeletal pain. It is then up to the occupational therapist and the client to collaborate throughout the therapeutic process in order to tailor a self-management program that will be effective in the client's daily life.

A final surprise was the enormous lack of research on chronic musculoskeletal pain. As seen in Figure 1, of 801 articles that were found utilizing inclusion criteria, only 22 of the articles met the inclusion criteria of this study and were sufficient to be included in the organizational framework. Overall, 801 articles is seen to be an insignificant amount seeing as the 116 million individuals have disabling effects (Rochman, Sheeman, & Kulich, 2013).

It is even more surprising seeing as the searches that were conducted throughout the systematic review process were extended to include allied health providers because of the already expected limited amount of research. Of the 801 returned articles, 182 studies lacked the use of interventions. This shows that presently there is little research emphasis on testing intervention options in order to find the best self-management interventions. This was seen in the organizational framework as no two articles were focusing on the same intervention.

Overall, the lack of evidence limits occupational therapists' and allied health providers' evidence-based intervention options for clients with chronic musculoskeletal pain. More rigorous and specific research is needed to address the research gaps present for populations of people with chronic pain diagnoses, including those of varying age groups.

### **Supplementary Information**

A small number of articles were excluded from this systematic review because of their rarity and lack of fit for the specific parameters in this study. These included articles about sleep (Kwekkeboom, Abbott-Andersen, Cherwin, Roiland, Serlin, & Ward, 2012; Buxton et al., 2012), focus on a specific culture (Xiao, McCurdy, Stoecklin-

Marois, Li, & Schenker, 2013), and focus on beliefs of illness and utilization of a healing touch (Glattacker, Heyduck, & Meffert, 2013; Decker, Wardell, & Cron, 2012). The interventions in these studies could be used when working with individuals experiencing chronic pain; however, they did not fit within the scope of this study.

Protocols comprised a portion of the published literature that resulted from the literary search (Andersen, Juul-Kristensen, Roessler, Herborg, Sorensen, & Soorgard, 2013; Da-Luz Junior, Costa, Fuhro, Manzoni, De-Oliveria, Cabral, 2013; Hofmann, Peters, Deidl, Hentschke, & Pfiefer, 2013; Littlewood, Ashton, Mawson, May & Walters, 2012; Mahalhaes et al., 2013; Sundstrup, Jakobsen, Andersen, Jay, Persson, Aagaard, & Andersen, 2013). These study-protocols included information, hypotheses, and methods regarding suggestions for the completion of future studies with a firm emphasis on the need for randomized control trials (Andersen et al., 2013; Da-Luz Junior et al., 2013; Hofmann et al., 2013; Littlewood et al., 2012; Mahalhaes et al., 2013; Sundstrup et al., 2013). These protocols hold promise for future research, the gain in knowledge about chronic pain, and a promotion in effective chronic pain interventions in the profession of occupational therapy.

### **Limitations**

The systematic review process and full-text articles reviewed for this study present with several limitations. The first limitation is our lack of experience in completing systematic reviews, which may have impeded the research process. Though measures (such as review of existing systematic reviews, careful documentation of processes, and consultation with our advisor) likely improved the quality of the systematic review, our lack of experience in this type of research was a limitation.

Locating sufficient evidence was also a limitation, not only due to a lack of rigorous, published occupation-based research, but also due to the lack of consistency in the language used to define chronic pain. A broad variety of definitions of pain permeate research literature and this lack of congruence provided a limiting factor in locating literature and making direct comparisons between existing studies. For example, there were major discrepancies in the length of time between the varying definitions. Cassidy et al. (2011) defined chronic back pain having to last for at least 9 months, whereas, Coppack et al. (2012) reported that subjects have chronic back pain after experiencing symptoms for a mean duration of 2.6 years. The average duration found in this systematic review to define chronic pain was three months (Castro, Daltro, Kraychete, & Lopes, 2012; Da-Luz Junior et al., 2013; Garcia et al., 2013; Hofmann et al., 2013; Jensen, Engel, & Schwartz, 2006; Littlewood et al., 2012; Mahalhaes et al., 2013; Sherman et al., 2011; Vasseljen et al., 2012; Wong et al., 2011). As a result, occupational therapists and other health care providers must be mindful of these differences because they may influence the direction of therapeutic treatment.

Additionally, there is disagreement in research between chronic pain and the associated level of pain using a validated pain assessment. For instance, Sherman and colleagues (2011) indicated that a score of three, compared to a score of four (Wong et al., 2011) on an 11 point-scale suggests the subject may be experiencing chronic pain. Because of these inconsistencies in research, it is difficult for occupational therapists and other healthcare providers to understand when to appropriately utilize interventions for effective health promotion. Refer to Table 5 to view the sources and the various discrepancies to the definition of chronic pain.

*Table 5. Chronic Pain Definitions as Presented in the Literature*

Research Authors	Operational Definitions of Chronic Pain
Abbasi et al. (2012)	Low back pain of greater than 6 months duration
Cassidy et al. (2011)	Back pain for at least 9 months
Castro et al. (2012)	Musculoskeletal pain diagnostic for at least 3 months
Coppack et al. (2012)	Chronic back pain with mean duration of symptoms for 2.6 years
Da-Luz Junior et al (2013)	Chronic non-specific low-back pain with a duration of symptoms of at least 3 months
Garcia et al., 2013	Low back pain of at least 12 weeks duration and without a specific cause
Hofmann et al. (2013)	Chronic non-specific low-back pain is defined as pain persisting for at least 3 months, located below the costal margin and above the inferior gluteal folds, without referred leg pain and that is not caused by a known specific pathology
Jensen et al. (2006)	Chronic pain of at least a 3 month duration

*Table 5. Chronic Pain Definitions as Presented in the Literature*

Research Authors	Operational Definitions of Chronic Pain
Kiyak (2012)	Low back pain is usually defined as pain, muscle tension, or stiffness located below the costal margin and above the inferior gluteal folds, with or without leg pain (sciatica). Non-specific low back pain is defined as symptoms without a clear specific cause that is, low back pain of unknown origin
Mahalhaes et al. (2013)	Non-specific chronic low back pain, which does not have a well-defined etiology, presents pain for at least 12 consecutive weeks
Roche-Lebourcher et al. (2011)	Nonspecific chronic low back pain for at least 3 months
Sherman et al. (2011)	Chronic back pain lasting more than 3 months and scoring more than 3 on a 11-point “bothersomeness” scale of 0 to 10
Tefner, Nemeth, Laslofi, Kis, Gyetvai, & Bender (2012)	Chronic low back pain persisting longer than 7-12 weeks
Vasseljen et al. (2012)	Chronic specific low back pain for 3 months or more, and pain score of 2 or more on a 0 to10 Numeric Rating Scale (NRS)
Wong et al. (2011)	Chronic pain persisting for at least 3 months at the moderate-to-severe level [ie, at least 4 of 10 on an 11-point Numerical Rating Scale (NRS) pain score]

Finally, the articles that were included in the organizational framework each had limitations of their own. A common limitation included the lack of presentation of the psychometric properties of the instruments used in each study, including reliability and validity. Of the 22 articles included in the organizational framework, 14 did not include reliability or validity parameters for one or all of the instruments utilized (Baena-Beato et al., 2013; Beladev & Masharawi, 2011; Brooks et al., 2012; Cassidy et al., 2012; Coppack et al., 2012; Garcia et al. 2013; Gram et al., 2012; Kiyak, 2012; Marshall et al., 2011; Reneman et al., 2012; Roche-Leboucher et al., 2012; Sherman et al., 2011; Thorsell et al., 2011; Vasseljen et al., 2012).

Instruments are shown to have supported validity in order to show the instrument being utilized measures what it is meant to measure (Kielhofner & Fossey, 2006). High internal validity shows that there is no alternative explanation for an outcomes (Lieberman & Scheer, 2002). High external validity indicates that the subjects in the study represent the population as well as that the treatments symbolize current practice (Lieberman & Scheer, 2002). Reliability is shown to be supported to provide information showing that the instrument can be utilized over different circumstances, such as use with different raters or data gathering at different points in time (Kielhofner & Fossey, 2006).

If instruments are not found to have supported psychometric properties, there is no way of determining if the instrument used will produce consistent results in different studies or whether it measures what it is intended to measure. With regards to the articles utilized in the organizational framework, these instruments would include measurement of the effects of chronic pain, the occurrence of chronic pain, or even fear of chronic pain. Some of the instruments that were utilized in the articles in the organizational

framework did not cite supported psychometric properties. There is a discrepancy among researchers because in other articles the same instruments were statically supported.

Although it could be determined that the instruments were supported, individuals may lack the time needed to reference several other articles in order to make sure that those instruments have sound psychometric properties.

Another limitation commonly encountered in the reviewed studies was the presence of small sample sizes (Abbasi et al., 2012; Coppack et al., 2012; Law et al., 2012; Marshall et al., 2011; Nassif et al., 2011; Reneman et al., 2012; Wong et al., 2011).

According to Lieberman and Scheer (2002), a sample size of 20 or more subjects in a group is shown to have higher rigor than a group of less than 20. Within the studies used in the organizational framework, the sum of the group subjects together were above the 20 subject level; however, when separated into groups, the group sample size was at times lower than the recommend minimum of 20. Dickerson (2006) stated that a researcher should try and acquire the largest sample size possible even though this can make the study harder to complete due to more resources and time needed. However, if the number of subjects is too small, the study will not lead to results that can be generalized to a larger population (Dickerson, 2006). Refer to Table 1.1-1.15, 2.1-2.2, 3.1-3.3, and 4.1-4.2 in Chapter IV for specific limitations of each article.

### **Recommendations for Occupational Therapy & Allied Health Providers**

In conclusion, we have found an important relationship between the findings of this systematic review and the results that should guide future research for occupational therapy practice and allied health providers. (1) As noted and supported by evidence, more studies should be carried out focusing on the utilization of purposeful- and

occupation-based interventions addressing the needs of individuals with chronic musculoskeletal pain. There was a lack of research found that contributed to our study and therefore, developing more studies will protect the scope of the occupational therapy profession and, ultimately, improve the credibility of current practice methods and interventions. (2) In order to take a more active approach in research, practitioners should embed research into their practice routine to further enhance the credibility and the amount of clinically useful interventions to address chronic pain. (3) In addition, practitioners should carry out new research rather than utilizing data from previous studies to expand the amount of existing, specific, and rigorous evidence. As a result, investigating interventions utilized by occupational therapists and allied health providers regarding individuals with chronic musculoskeletal pain is likely to be a promising area for future research with outcomes that could significantly improve a clients' engagement in pain-free occupations.

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